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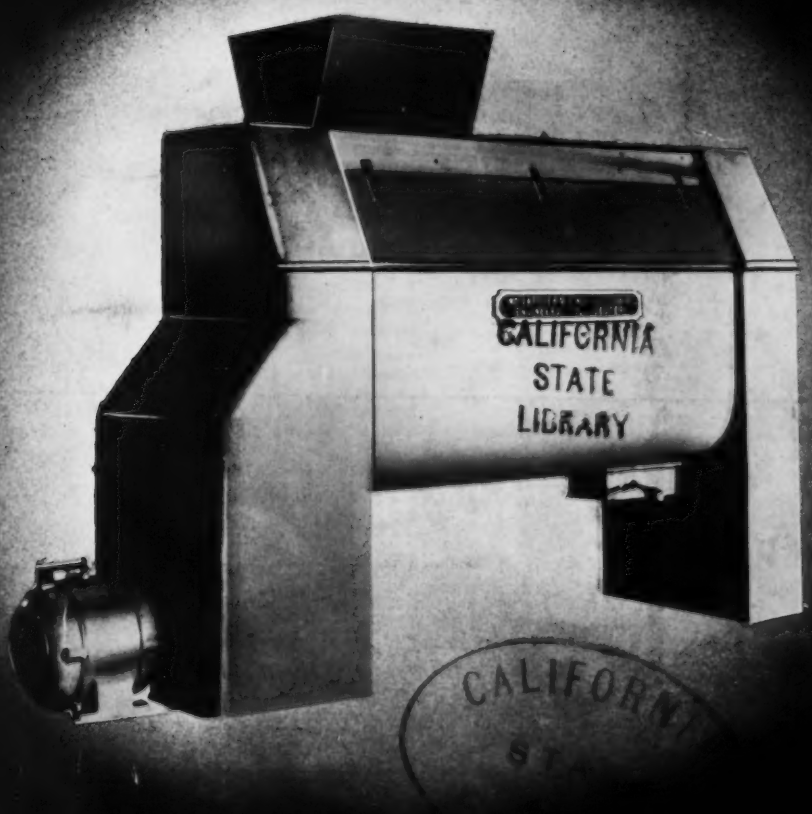

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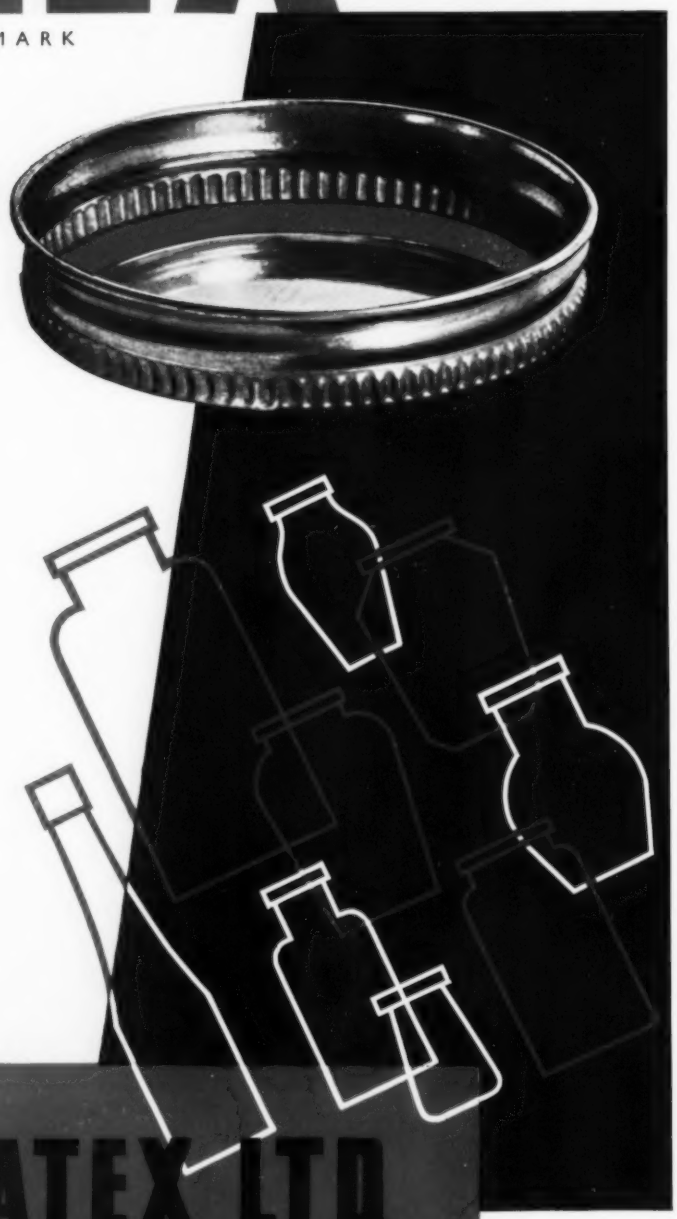

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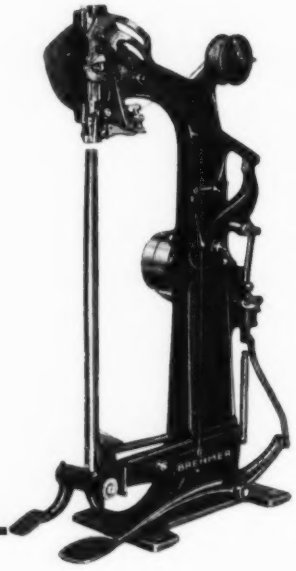
CONTAINER WIRE-STITCHER, No. 57½



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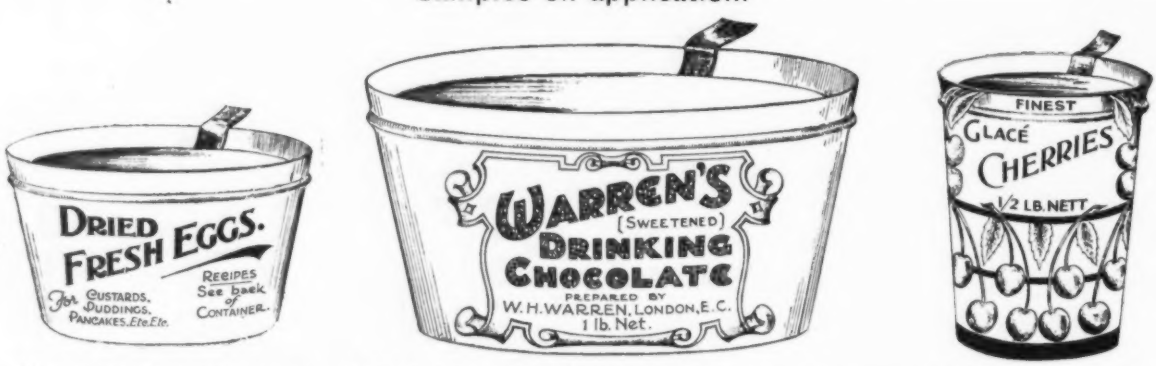

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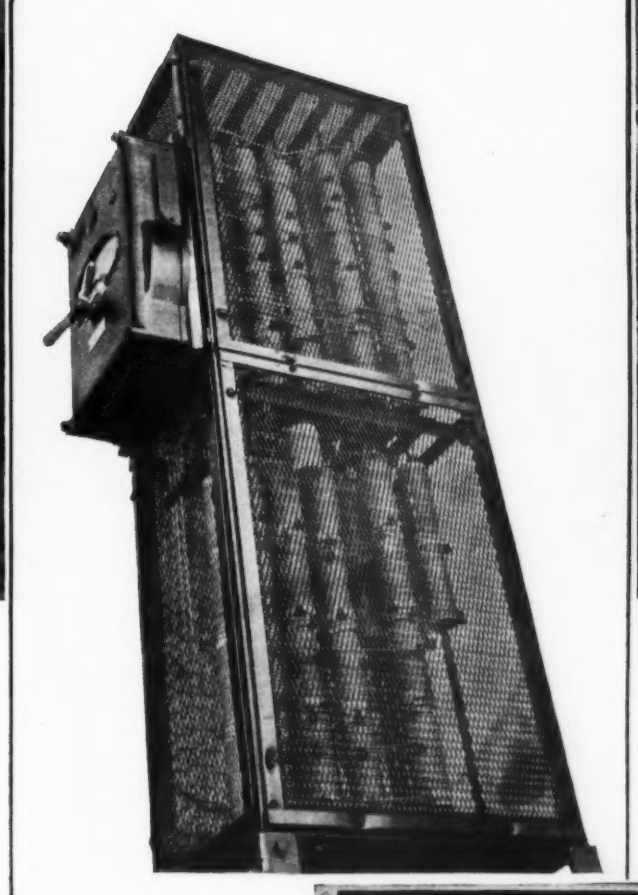

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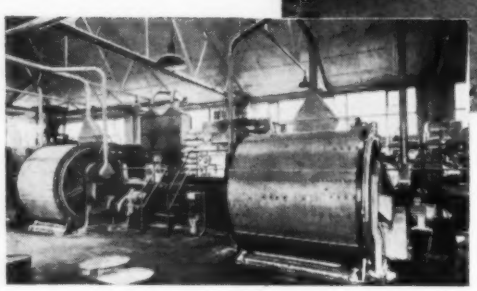

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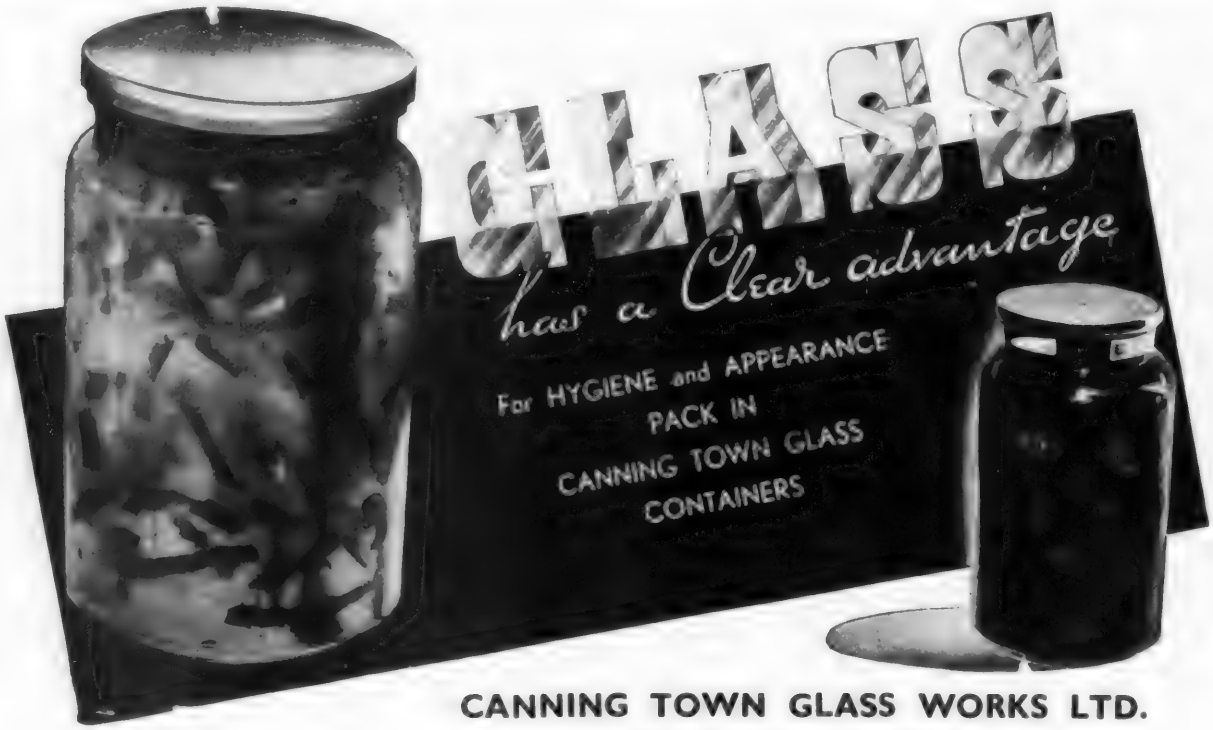

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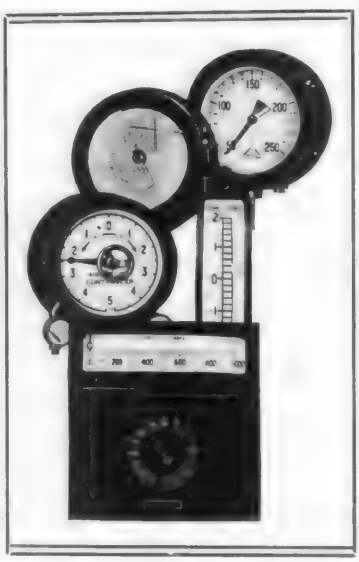

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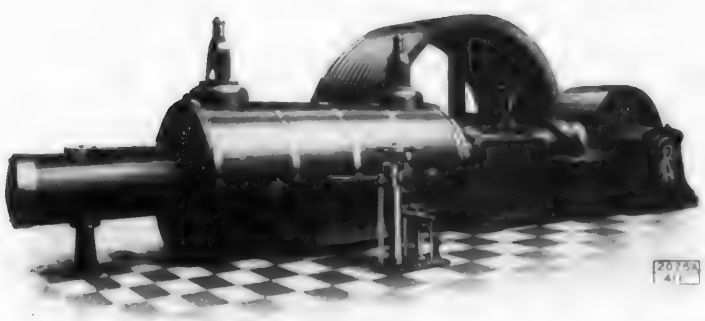

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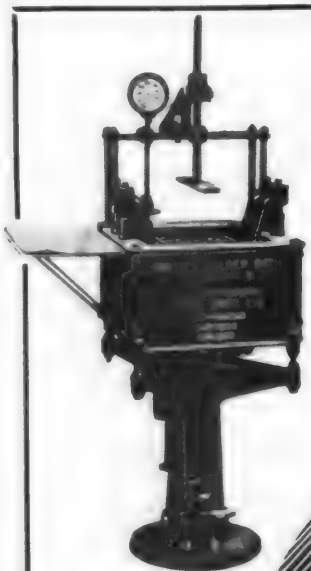

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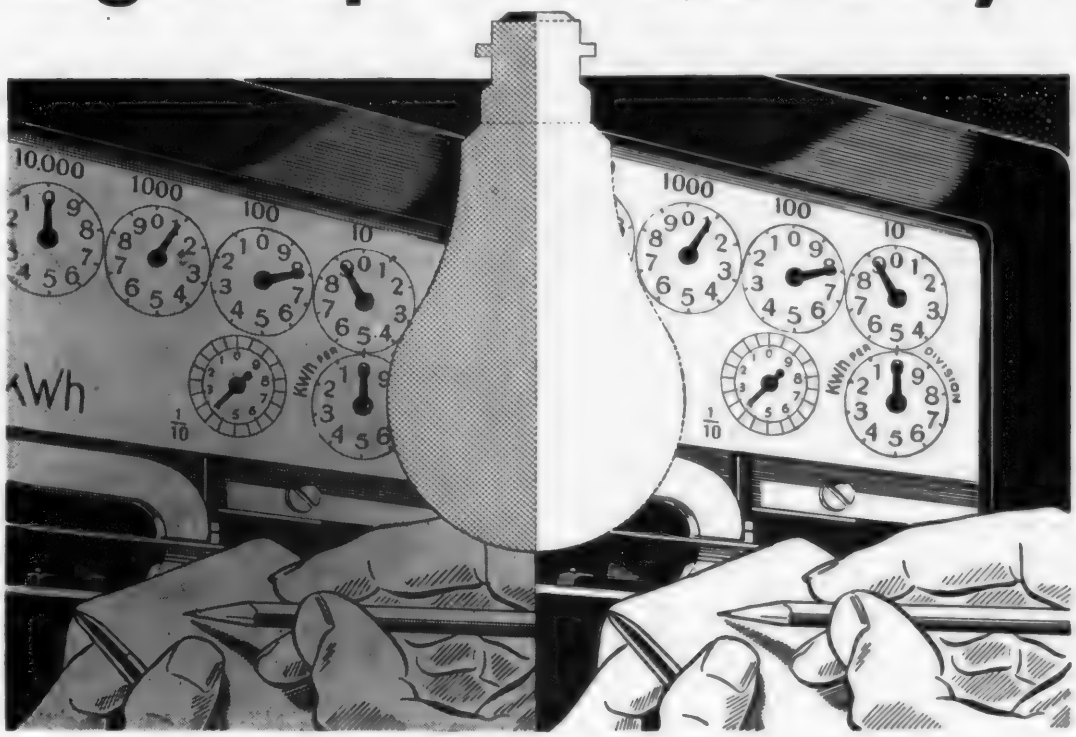

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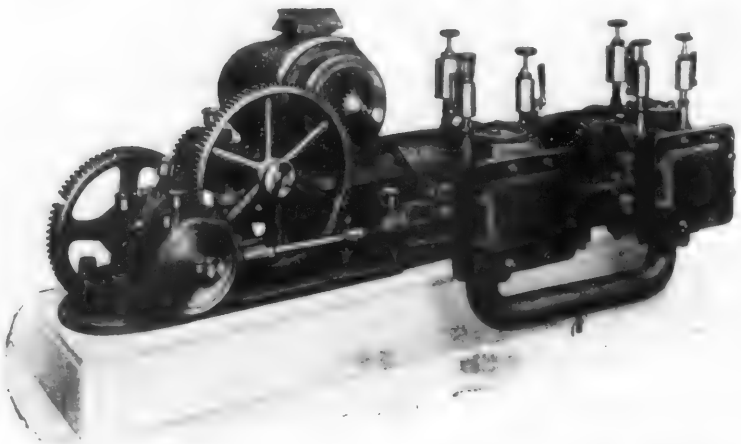

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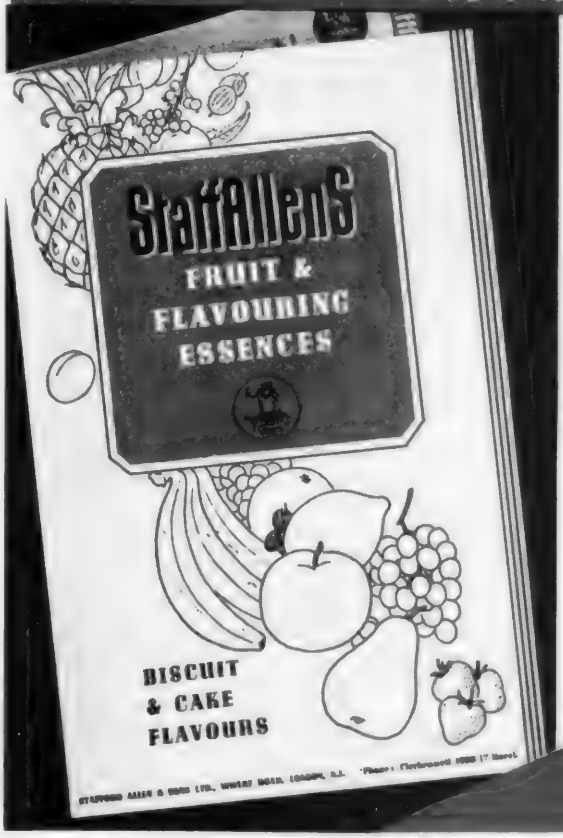

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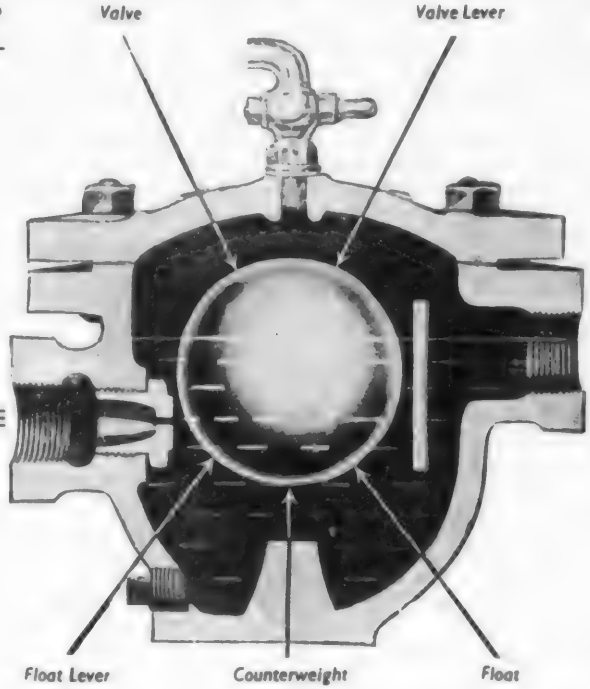

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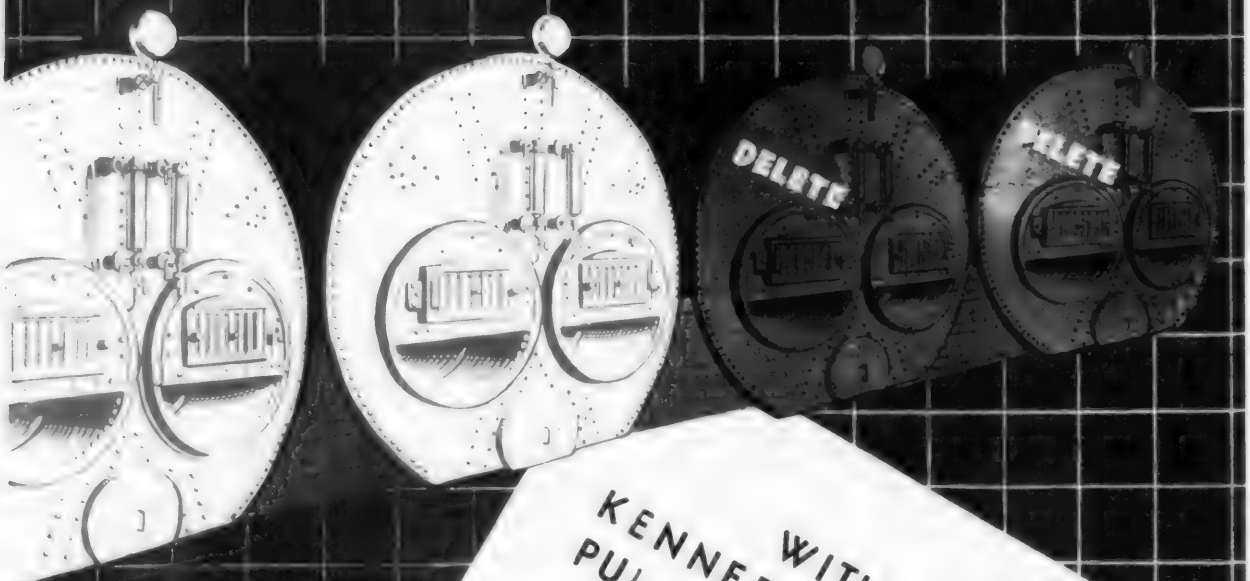

WITH THE KENNEDY SYSTEM OF PULVERISED FUEL . . . .

IF you can imagine a cubic inch of coal divided into 40 million particles . . . .

IF you can visualise those particles floated by an air stream and

IF you can appreciate the ease with which they can be completely burned

You will realise that the Kennedy system would be a marked improvement and economy on

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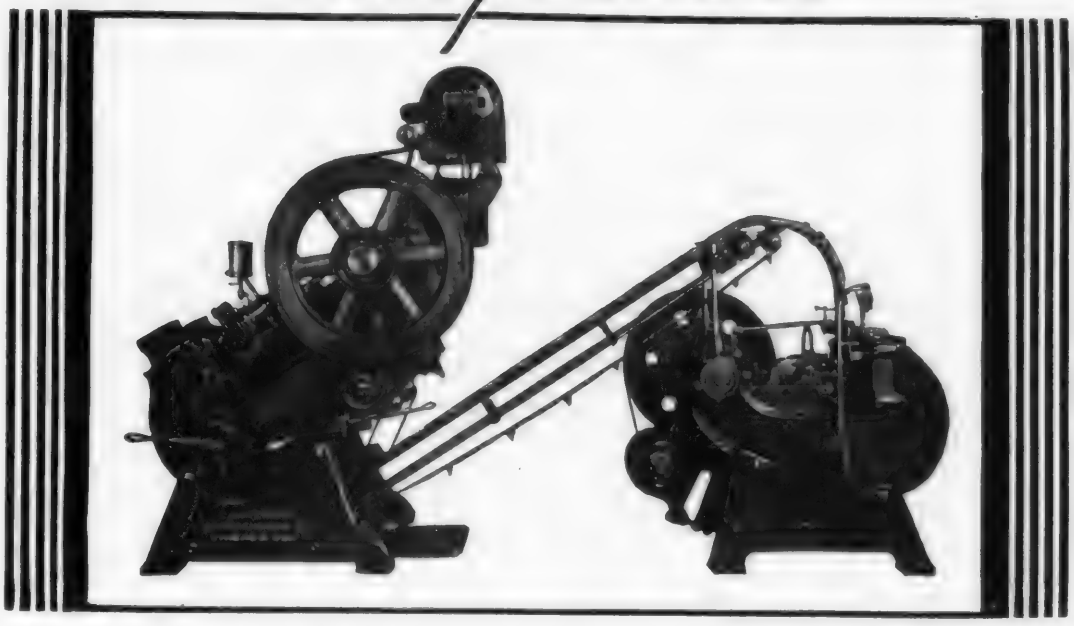
Machinery for making FISH CANS *by* CAMERON



The first Automatic Press takes the tinplate strip from its magazine, and with each stroke blanks out and forms the complete sardine can. The can is then conveyed and fed to the second Press which trims the flange to the proper size. Two simple punch press operations and the can bottom is completed.

Only one operator is required. He cuts the tinplate sheets into strips and with them replenishes the magazine of the Strip-Feed Press.

Cameron also builds Automatic Strip-Feed Presses for making the can covers, Die Lining Machines for applying the sealing compound to the covers, Closing Machines for the filled sardine cans, and every other machine required by can manufacturers.

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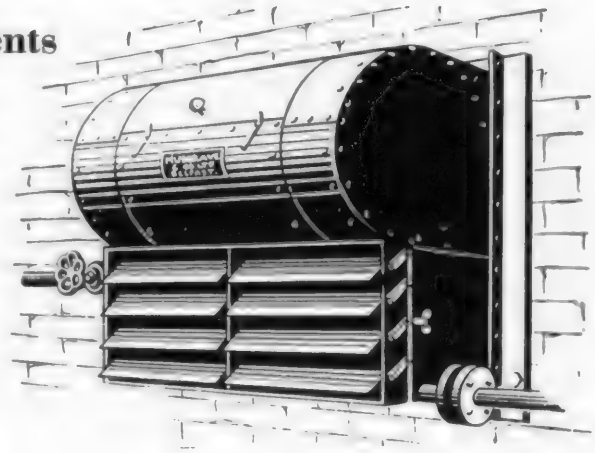
To Factories Act Requirements

Check up on your production figures during cold weather. You will realise that to be without an effective system of heating is a serious business liability.

Consult Musgrave's with regard to your particular heating problem. They will be pleased to advise you on the most suitable, efficient and economical installation best adapted to your needs.



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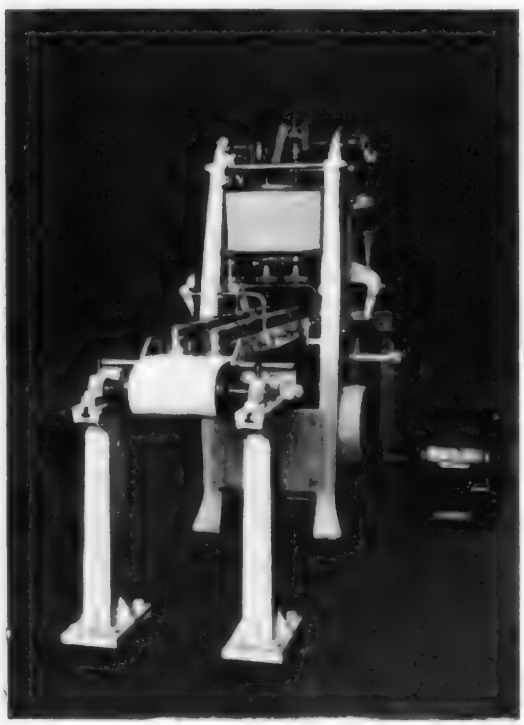

Illustration of Twin-Head Filler.

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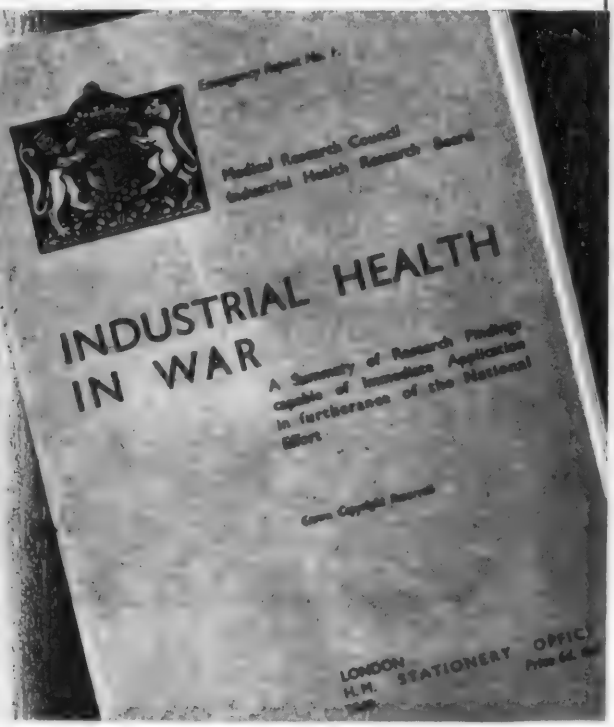

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Advising on war-time industrial conditions, the Government's Emergency Report No. 1, " Industrial Health in War," states :—

" . . . difficulty will probably be experienced . . . where reliance is placed on natural ventilation. The complete screening of windows and sky-lights will necessarily reduce ventilation to an undesirably low level . . . In black-out conditions, special provision for ventilation is urgent . . . lest the efficiency and comfort of the workers should become impaired. Where a night shift is worked . . . adequate ventilation is even more imperative. A ready method of providing the needful ventilation is by introducing some mechanical system."

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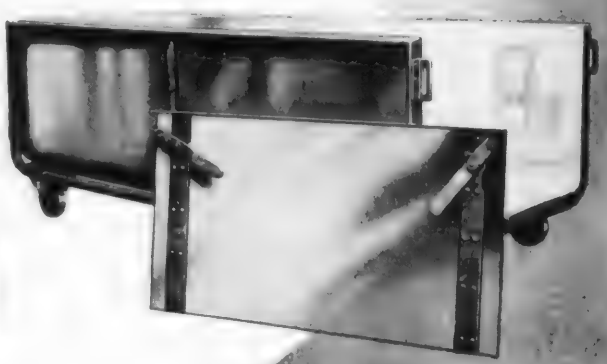

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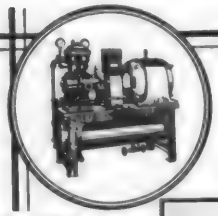

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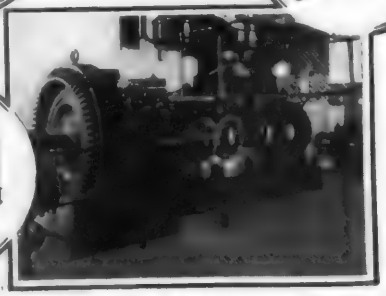

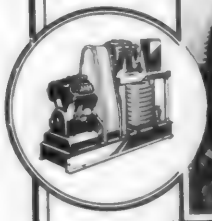

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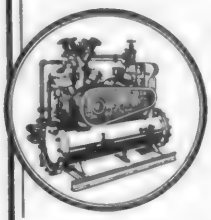

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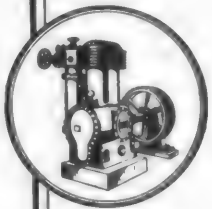

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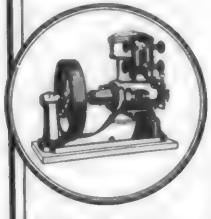

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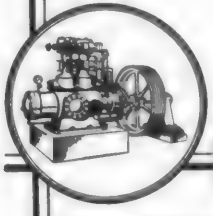

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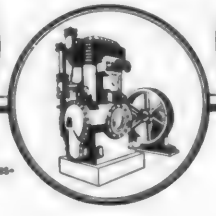

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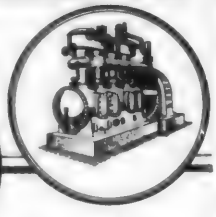

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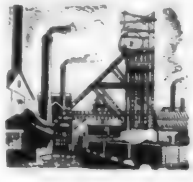

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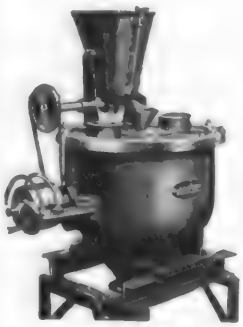

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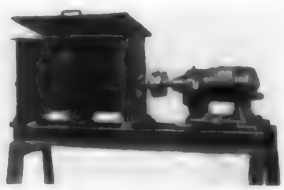

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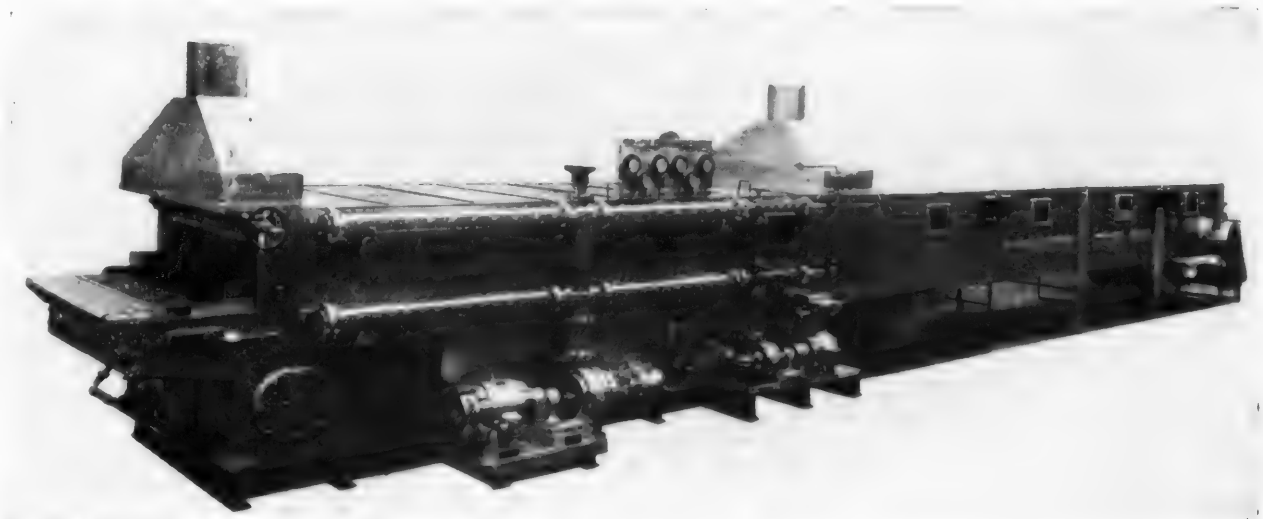

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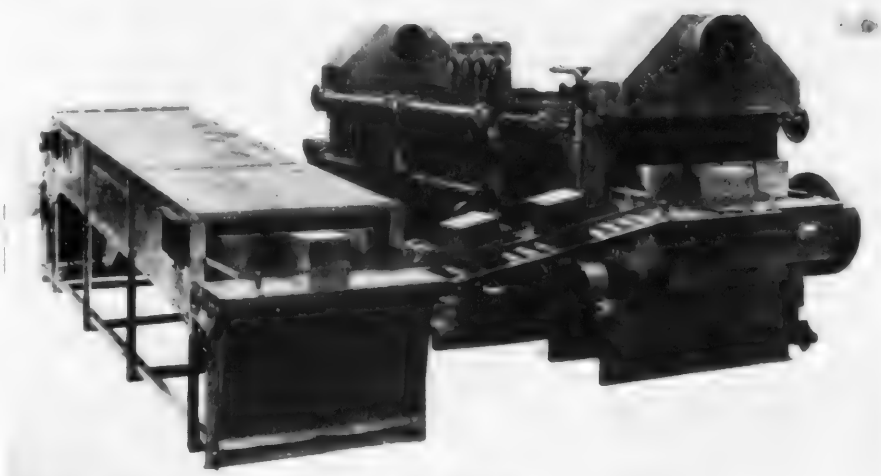

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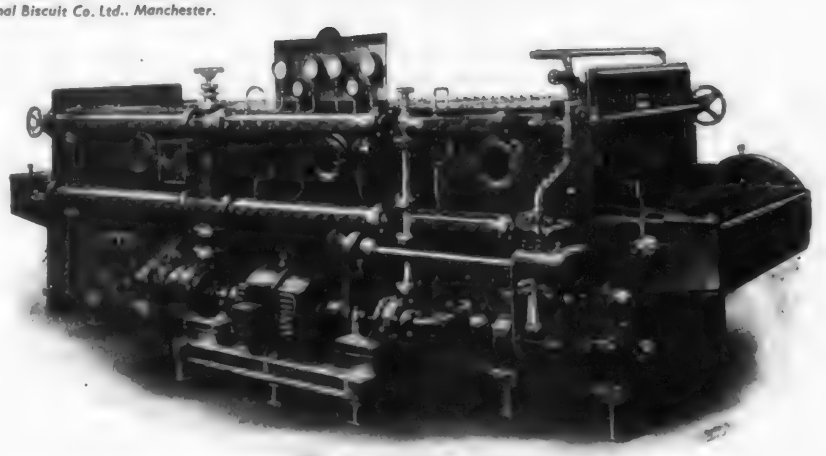

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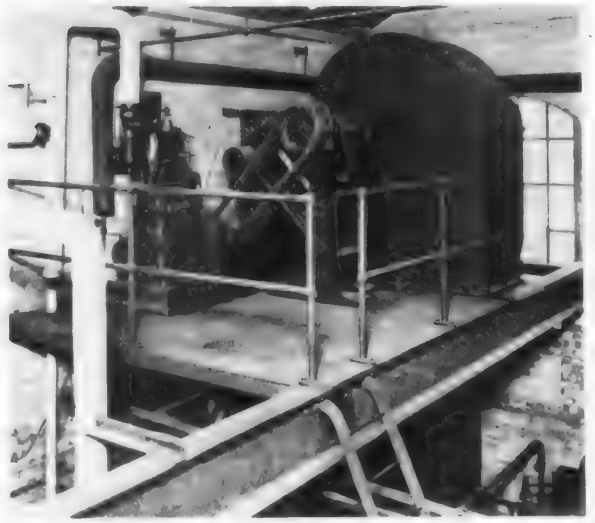

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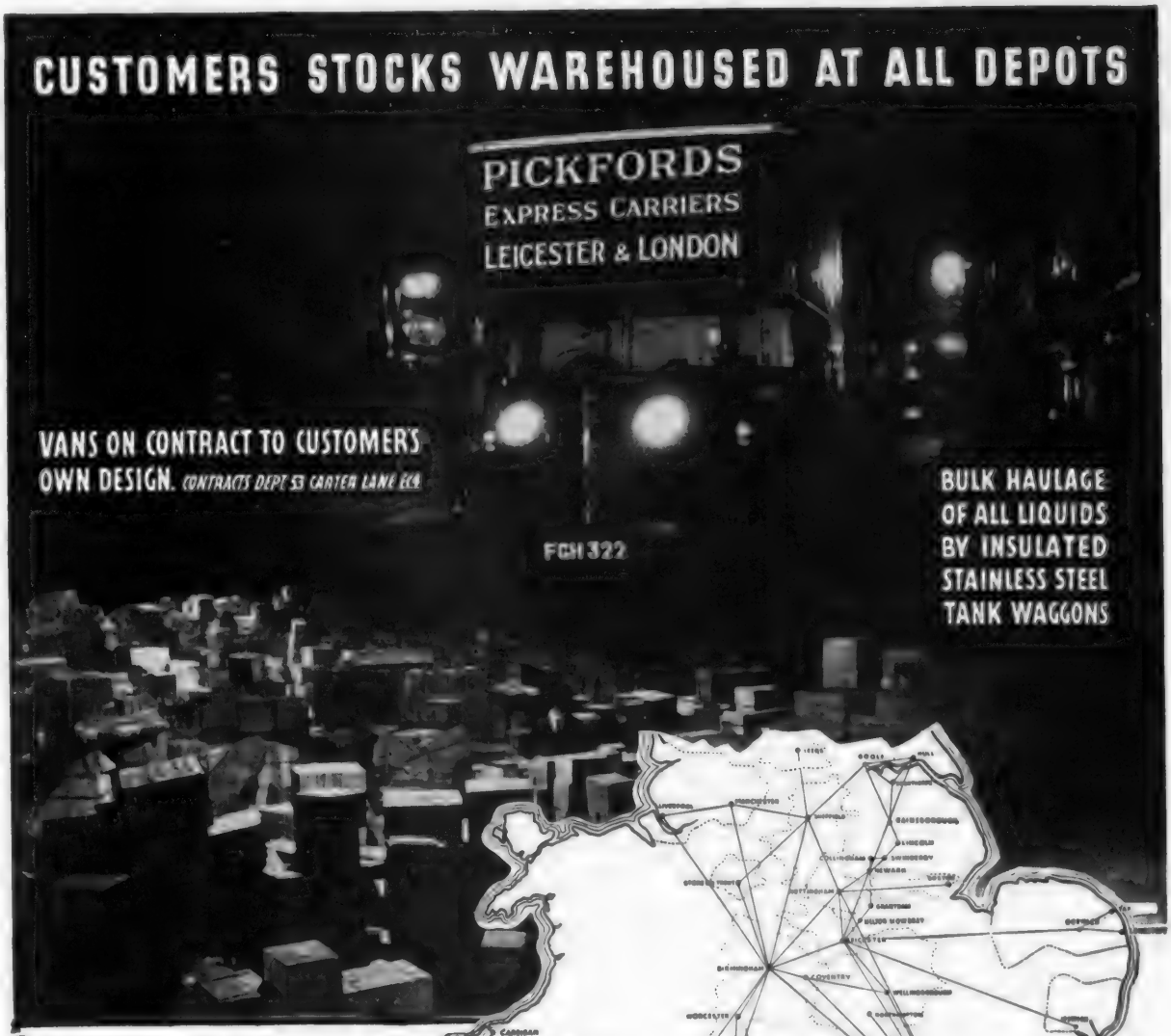

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FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

VOLUME - - - XVI

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XVI, No. 1 January 3, 1941

Health in War-Time

THE STATEMENT that the health conditions of 1939, in spite of eight months of uneasy peace and four months of war, were uniformly better than the preceding twelve months; made by the Minister of Health in the House of Commons recently, was good reading. Not even the calamity of war, with its inevitable disturbances and interruptions of many good works, could stay the steady upward surge in health services during the last twenty years.

During 1939 the number of infants in England and Wales dying during their first year of life was 50 per 1,000 live births as compared with 53 in the previous year, and this rate was the lowest ever recorded in this country and was less than half the corresponding figure for 1914.

The maternal mortality rate during 1939 was also the lowest ever recorded in this country.

Among many advances in public health and hygiene mentioned by Mr. Macdonald were the increasing recognition among all classes of people of the importance of eating sufficient of the body-building and protective foods and the inauguration of the national scheme of cheap or free milk for nursing mothers and infants, and doubtless these things have contributed to the remarkably good state of the nation's health during the year.

Bread for Coventry

The superhuman endeavour shown in feeding the people of Coventry has been commented upon by the *Baker and Confectioner*. The wisdom of the Minister of Food in devising arrangements against such an eventuality was amply justified, and the organisation was found capable of meeting in practice the heavy demands that theory had placed upon it. In this task of feeding a multitude of people, the miracle of the loaves and fishes came near to being repeated, and, indeed, in retrospect it does begin to take the shape of a miracle that the people were fed at all.

As regards bread, local bakers were faced with the difficulty of insufficient water, and the local emergency bread arrangements were put into operation quickly and effectively to import bread into the city. At 11 o'clock on Sunday morning 25,000 2-lb. loaves had been sent in, and by 4 o'clock 40,000 had arrived. In the meantime, bakers in the city immediately went to work. They quickly surmounted their difficulties, began to function, and were, as soon as humanly possible, back to normal. In all the devastation of this town the continued existence of the loaf was probably the greatest comfort to a bomb-shocked people.

Making Water Safe

A timely reminder has been given by Dr. E. F. W. Mackenzie, Director of water examinations for the Metropolitan Water Board, that consumers should know what to do to render water safe for drinking and cooking—that is, to boil it thoroughly.

If boiling is impossible, owing to damage to gas mains or electric cables, ten drops of chlorinated soda solution should be added to each pint of water and then, after stirring and allowing to stand for at least five minutes, a crystal of photographic hyposulphite of soda should be dissolved in the chlorinated water to remove the unpleasant taste. Dr. Mackenzie has urged that disinfectants other than chlorinated soda should not be used except under the supervision of a chemist, and he has suggested that people should buy the chlorinated soda and "hypo" from the chemist and try out the method once or twice in order to prove its simplicity.

We doubt very much whether the ordinary run of people would ever go to the trouble of applying the chemical means of purification, and we would prefer that stress be laid upon boiling.

It is a satisfaction to know that should there be any doubt as to the purity of the water supplied by the Metropolitan Water Board, consumers will be notified, and we trust that this example will be followed by all potable water concerns. We feel that without unduly alarming the public, periodical advice on the importance of precautions regarding water should be given.

Vitamin B Complex in Normal Nutrition

We have seen an average of one B vitamin synthesised every year since 1936 when vitamin B_1 was first synthesised. The work on the relation of these vitamins to metabolism has not only aided us in understanding the function of the vitamin, but in many cases it has also helped us to understand the intricacies of metabolism itself.

The way some of the new information about B vitamins can be used to improve public health is discussed in a paper presented by Professor C. A. Elvehjem, presented last September at the Bicentennial Conference, University of Pennsylvania, the substance of which was published in *Nature* for November 23, 1940.

Referring to the use of synthetic vitamins, Professor Elvehjem, while saying that a return to the less-refined foods used by our forefathers would solve some of the difficulties of vitamin deficiency, admits that it would be just as difficult to return to these diets as it would be to return to the use of the horse and trap. He summed up this situation by saying that "our natural foods are packaged and devitalised and the vital elements are concentrated and sold in the chemist's shop", but adds the question, "How are we to know what to buy from the grocer and what we should get from the chemist?"

"Fortification" of Foods

An interesting statement is quoted from Baker *et al.*, who have concluded that the best-fed English population, while getting twice as much B_1 as people in the low-income group, consume less of this vitamin than the Paris poor of the eighteenth and nineteenth centuries.

Professor Elvehjem discusses concentrates and synthetic vitamins in a very interesting way and in general is in favour of the fortification of foods, as he could see no difference between the addition of sodium chloride and vitamin B_1 to foods, but at the same time he qualifies this statement by pointing out many of the difficulties inherent in fortification (we wonder who thought of this clumsy word in this connection). One of the most serious arguments against adding the several vitamins which are

apparently necessary is that it would merely increase the cost of the foods and move them farther than ever from the population group needing them most. He also suggests that "if the agriculturist, the processor, the medical man, and the man in charge of control work will work hand in hand for the sake of improved health, deficiency diseases should be reduced to a minimum", and here we think that he has got to the heart of the problem.

Thiourea as a Fruit Preservative

A few years ago the use of thiourea (thiocarbamide) was suggested by F. E. Denny in America for the purpose of preventing the browning of cut surfaces of fruits and of some vegetables. This browning is a feature to be avoided not only in the preparation of fresh fruit salads, but also in the canning of some fruits, in the preparation of fruits for bakers' use, and in the drying of fruits and vegetables. Information regarding the toxicity of thiourea was scanty and not very applicable to human beings. On account of the possibility that the use of thiourea might be taken up by the food industry, the Boyce Thompson Institute for Plant Research, Inc., asked for a study to be made of the toxicity of thiourea. The results of this study have just been published in two papers in the *Contributions from Boycè Thompson Institute*. Such a study was the more necessary as it has been found that the minute amount of thiourea that is used must remain on the cut surface to prevent browning from occurring.

The method of treatment is to dip the freshly sliced or otherwise cut fruit into a 0·05 or 0·10 per cent. solution of thiourea in water. A kilogram of sliced apples has been reported to take up about two ounces of the solution, representing an insignificant weight of the substance.

Feeding experiments with rabbits, rats, guinea-pigs, and one man showed no evidence of any toxic action unless relatively enormous amounts of thiourea were given; the experimental animals normally remained in perfect condition. Daily doses given to rats without producing any unfavourable effects over a period of many weeks would be equivalent to about five hundred times the amount ingested by a man eating six ounces of treated fruit. The toxic dose is many times higher, and it appears that thiourea when taken by mouth in reasonable doses is harmless. No toxic effect can be expected from eating half a pound of fruit treated in the quantities recommended for preventing browning.

Artificial Cream Decision

Manufacturers of dairy cream are not to be allowed to produce artificial cream to replace the prohibited product. This decision has been reached by the Ministry of Food.

The Central Milk Distributive Committee pointed out that as the manufacture of artificial cream was still permitted, there would be grave danger of the trade in dairy cream being permanently damaged unless creameries and dairies were allowed to manufacture synthetic cream while the ban on the dairy product continued. Bakers and confectioners were among the largest buyers of dairy cream. They are now using the artificial product, and the Distributive Committee felt that they might continue to do so after the ban on dairy cream is removed.

The Food Ministry has now decided that supplies of oils and fats for the manufacture of synthetic cream cannot be granted to creameries and dairies as the limited supplies available are required for other purposes. Regular manufacturers of synthetic cream have been rationed for their raw materials since the beginning of the war, and at present receive only 80 per cent. of their pre-war requirements. Moreover, the number of producers of dairy cream is so large that, in the Ministry's opinion, serious difficulty in distribution would be created if allocations of oils and fats for synthetic cream making were to be made available to these firms.

Dried Potatoes

Certain varieties of potato survive the frost at 15,000 feet in Andean regions, and is practically the only vegetable cultivated in this area, which is unsuitable for maize, owing to aridity or liability to frost. An interesting product is the *chuño* (preserved potato), which is made by the natives as a reserve against failure of harvest, and is the basic form of carbohydrate used through the *alto* of South America. *Chuño*, indistinguishable from present-day *chuño*, is found in pre-Inca graves, and may possibly be as much as 2,000 years old.

The modern method of manufacture appears the same as in prehistoric times. The potatoes are spread over the ground overnight and are allowed to freeze. In the morning, as soon as they are thawed by the sun, the Indians tread them out with their bare feet, which removes some of the moisture and some of the skin from the potato. They are then dried. For the better quality the process is repeated several times. The material is then put into a shallow pool and left for two months, after which it is dried off in the sun and converted into a snow-white material, very light in weight. It is then called *tunto*, or *moray*. It is used for flour, and is the ingredient for stews and soups.

The climate of the Bolivian *alto-plano* is showery three months in the summer, followed by nine months of almost absolute drought, and this climate enables *chuño* to be made. However, the conditions could be reproduced artificially, and it is just possible that an article whose stability amounts to 2,000 years might have some commercial possibilities in this country.

Micro-Determination of Copper

The diethyldithiocarbamate method for estimation of copper in biological material has been improved in simplicity, speed, accuracy and sensitivity by A. Eden and H. H. Green (*Biochemical Journal*, September, 1940). Rapid wet digestion, with a combination of sulphuric, perchloric and nitric acids in 8 by 1 in. pyrex test tubes, is employed for destruction of organic matter, followed by deionisation of iron with citrate or pyrophosphate in strongly alkaline medium. Subsequent colour formation and extraction with amyl alcohol are effected in the combustion tube itself. With quantities such as 3 ml. blood containing 3 μg Cu, the final reading is either colorimetric or photometric, but with limited material from small laboratory animals, involving determination of real amounts of Cu as low as 0·3 μg, photometric finish with a low wavelength light filter is essential. About 30 determinations per day can be completed by a single analyst.

Coffee and Cocoa

Annual surpluses of coffee beans have troubled the Brazilian producers for a good many years. Thousands of bags went up in smoke each year before the war, and the position is now aggravated by the loss of the European market. An American process for processing coffee into a plastic material is now understood to be undergoing large-scale trials in Brazil, a country which is a potentially big market for plastics. Perhaps we shall soon hear of Brazilians sitting in their *cafés* at tables covered with gaily coloured coffee plastic, sipping coffee from coffee-cups while their cigar ash is flicked into coffee ashtrays.

The success of the experiment might stimulate efforts to solve the economic problems of other food-growing industries on similar lines. Cocoa is having its share of trouble at the moment. With its high protein and fat content it may repay examination as a raw material for the plastics or allied industries. It would be interesting to hear whether any work in this field has already been carried out. It is not merely a question of helping British cocoa interests, for a prosperous West African native population would mean more business for Lancashire cotton manufacturers.

Effect of Canning on Vitamins

Year by year the literature on the effect upon vitamins of the different canning operations becomes richer and richer; it is rare that a month goes by without the publication of new research on the subject.

C. R. Fellers, W. B. Esselen, Jr., and G. A. Fitzgerald, writing in *Food Research*, 5, 5, review the literature dealing with the stability of vitamins B_1 and B_2 contained in vegetables subjected to both quick-freezing and canning. Controlled samples of the same lots of asparagus, peas, lima beans and spinach were quick-frozen and canned by commercial methods and their vitamin B_1 and B_2 content was compared with that of the raw vegetables. Fresh asparagus, peas, lima beans and spinach were found to contain 65, 133, 67 and 36 International Units of vitamin B_1 and 53, 70, 122 and 143 Bourquin-Sherman Units of vitamin B_2 per 100 grams respectively. Taking the vegetables in the same order, they retained 78, 97, 46 and 94 per cent. of their vitamin B_1 and 95, 100, 84 and 91 per cent. of their vitamin B_2 respectively when quick-frozen. When canned they retained 72, 60, 28 and 71 per cent. of their vitamin B_1 and 98, 100, 70, and 45 per cent. of their vitamin B_2 respectively. The authors mention that the length of the blanching period may influence the two vitamins because of their solubility in water; minimum blanching periods consistent with the requirements are recommended. They conclude that both quick-frozen and canned vegetables retain nutritionally significant percentages of vitamins B_1 and B_2 and that both types of preserved foods are good sources of these two water-soluble vitamins.

Science and the Nation

"The Annual Report of Council contains a notice of the recent formation of a Scientific Advisory Committee over which Lord Hankey presides, with a reference which in effect directs it to consider the advances of science in their relation to national welfare. The Committee reports to the Cabinet through its chairman. A Committee of similar nature but lesser scope was set up a few months ago to consider the scientific aspects of the food policy of the Government; it consists of well-known authorities on nutrition, agriculture and economy, with myself as chairman," announced Sir William Bragg in the course of his address at the Anniversary Meeting of the Royal Society on November 30. "This Committee reports to Lord Privy Seal, and so to the Cabinet Food Policy Committee over which Lord Privy Seal presides. The significant feature of these committees is their close and direct association with the Cabinet, the central body that governs our nation. Hitherto scientists have been appointed man by man to various Government Departments so that they might act as useful items in departmental machinery. The new committees are not parts of any executive body and have no executive power of their own. They exist to make recommendations, which must, of course, be practical and take full account of difficulties of execution."

The Rôle of the Scientist

Sir William Bragg touched upon the functions of the scientist, a subject which has been rather hotly discussed by one or more of the twenty-five anonymous scientists in *Science in War*. It was there deprecated that "on the whole scientists are excluded from discussions on policy and even more so on decisions. As a result, even the most authoritative scientific committees often flounder in the dark and their work, however excellent and to the point, may be unused for vital months".

Sir William considers that a great opportunity is now opened after long expectation, and the Royal Society is largely responsible for the development of that opportunity. He says, however, that it is not claimed that scientists shall be entrusted with authority because they are scientists; but that it is claimed that authority should be exercised in the light of a knowledge which grows continuously, and with continual effect on politics, on industry and on thought itself. If at present the only way to bring this knowledge into use is to treat scientists as consultants, let us take that way. That way, we feel, deprives the real scientist of much of his value, and, on the whole, we incline to the views expressed in *Science in War*.

Scots Beet Sugar Production

Officials of the British Sugar Corporation at Cupar, Fife, stated on December 4 that the 1940 sugar beet campaign in Scotland, which has just concluded, has produced highly satisfactory results. It has added over 8,000 tons to the home-produced sugar supply of the country, and, in addition, growers have found the beet crop remunerative.

The average crop over the whole of Scotland has worked out at 8·5 tons per acre, with an average sugar content of 17·5 per cent. On good ground returns have been considerably better. In some cases the crop has realised £40 per acre from yields of 14 tons per acre and upwards.

Contracts for the 1941 season will shortly be entered into. Terms show an increase of 6s. 9d. per ton over those of 1940, or 59s. 3d. per ton on a basis of 15¼ per cent. sugar content, 65s. 11d. per ton on the basis of 17¼ per cent. sugar content—the average for this year's crop.

Onion Juice and Bacterial Growth

Workers have demonstrated that the vapours of crushed garlic contains a strong bactericidal substance which may possibly be acrolein, crotonaldehyde or some closely related compound. Lovell (1937) reported that onion vapours have a weaker and more quickly lost bactericidal effect than that of garlic vapours. James E. Fuller and Ernest R. Higgins (*loc. cit.*) have studied the possible influence of uncooked onion tissue or juice on the growth of bacteria.

Studies were made of the growth-inhibiting property of onion juice for several species of bacteria, which represented both air-borne contaminants and species which usually came from the human source. Juice filtered through a Seitz loses all of its bactericidal vapour, but still retained some power to inhibit bacterial growth when it was incorporated in a fluid medium. Growth of bacteria from human source was not inhibited sufficiently to suggest any practical value of the property. The onion juice was more effective in preventing growth of bacteria of the *B. subtilis* group. Live steam (Arnold) greatly weakened the potency of the juice and autoclave sterilisation practically destroyed it.

Protean Pork and Black Pudding

The old problem of classification of specified articles has cropped up once or twice in the last month. A butcher was prosecuted by the Ministry of Food for producing bacon without a licence, the reply being that it had been sold by him as salted pork. The difficulty has now been solved by a new Order, recently issued, which explains that if the curing process exceeds forty-eight hours it becomes bacon, but before the expiration of this period it is still technically pork.

It is intriguing to know that the pork "suffers a sea change" as the clock strikes the forty-eighth hour.

Another interesting point recently decided was whether a black pudding is a sausage. The Stipendiary Magistrate decided that it was not and that it could not contain preservatives as is allowed in the sausage. So that settles the case of:

Fat black puddings, proper food
For warriors who delight in blood.

BOILER HOUSE EQUIPMENT

PROGRESS IN 1940

H. C. APPLEBY

IN a broadcast made recently by Mr. A. R. Grenfell, M.P., Secretary for Mines, he stated, "We can all cut down consumption if we give attention to waste", and that "there is great scope for economy in industrial plants, and even coal must play its part. Saving is a direct and valuable contribution to the war effort". Keen industrialists have, of course, cut all observable waste down to a minimum as well as all indicated though not necessarily observable waste on their plant.

Those concerned with the production of equipment designed to prevent wastage of fuel are constantly introducing new and improved items, and, during the past year, in spite of the difficulties associated with production under war-time conditions, a number of valuable improvements which merit the consideration of steam users have been introduced. Among these are coal-, water- and steam-measuring apparatus; plant for the treatment of boiler feed water; feed heaters and economisers; various types of machines for coal feeding to boilers and to furnaces used for heating in processing. Considerable progress has been made in the matters of furnace design and refractories for furnace linings. In the course of a short article it is only possible to indicate a few typical examples among the many which those who are installing new or improving existing plant have to choose from.

Feed-Water Treatment

The necessity for feed-water treatment is, with some exceptions, generally recognised. Scale, of course, is a well-known enemy. Foaming and priming, produced, among other things, by organic matter, are troublesome phenomena, and both result in dirt being taken by the steam to any plant which is connected to the steam lines from the boilers. Several proprietary preparations have been used with marked success in preventing scale formation by application inside the boiler.

It happens sometimes that the use of such may replace mechanical removal of scale by boring. The author recently investigated the cause of abnormally high fuel costs in a large boiler-house. Among other things it was noted that the economiser was not functioning at anything like its best. The temperature of the flue gases was not lowered as much as it should have been, although due provision had been made for the proper number of economiser pipes for the boilers in use. This suggested scaled-up tubes, especially as the scrapers outside the tubes were working properly. When the economiser was opened up it was found that in the tubes there was a very hard layer of scale more than 1 inch in thickness. Boring was one remedy, but it would have put the economiser out of commission for three weeks. An alternative, the use of a chemical solution, was adopted, which only involved a three days' stoppage of the plant. The cost of the treatment was less than one-fourth that quoted for boring, and the risk of fractured pipes, which sometimes accompanies the boring operation, was obviated. The material was also used with success in dealing with furred-up superheaters, dirty condensers and coils of heaters.

An entirely new system of water softening, particularly suitable for small plants and particularly applicable where conditions do not permit the use of large settling tanks, has been evolved. According to this system the whole process of water softening is promoted inside the boiler by the existing pressure and temperature. The feed water is carried directly into the boiler by the existing feed apparatus without previously passing through the water-softening plant. The pressure and temperature inside the boiler precipitate the substances causing temporary hardness and, assisted by precipitating reagents, those causing permanent hardness. When the precipitate accumulates in the lower portion of the boiler, as a result of thermo-syphon action, circulation of the water from the boiler through the apparatus occurs, and the water which contains the precipitates is led, on entering the apparatus, through a vertical gravity pipe, to the bottom. There it turns upward again and rises outside the gravity pipe to the top. As a result of contact with a number of baffles, sludge is segregated and eventually deposited in a sump at the bottom of the apparatus. The chemical treatment is in conformity with well-known theories, but the ingenious baffling arrangement presents an effective means of disposing of sludge with much less loss of hot water than by using the usual method of blowing down. The illustration shows the apparatus connected to a Lancashire boiler.

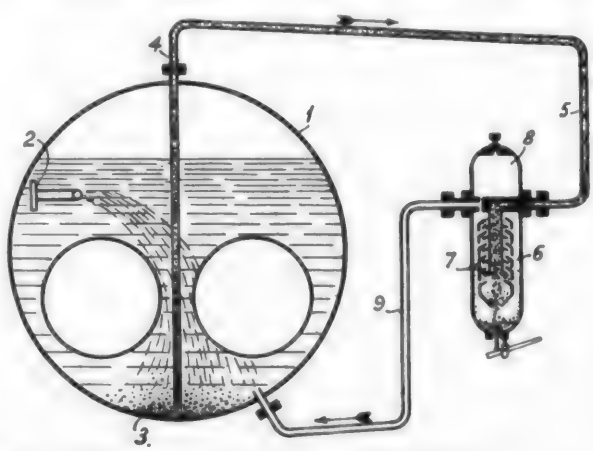
Feed-Water Heaters

It is always desirable to introduce the feed water into an economiser at a temperature above 100° F., otherwise there is the danger of condensation on the bottom headers and the lower portion of the tubes, which frequently results in external corrosion. In addition, soot becomes hard and prevents scrapers from working. To avoid this, a feed heater is usually employed, and it is generally preferable to use one of the "closed-heater" type. Heaters have been designed with tubes arranged in different types of bends and formations, and are placed in the water line between the boiler feed pump and the economiser. The amount of heat absorbed by the water per square foot of heating surface varies according to the velocity of the water through the heater and the mean temperature difference between the steam and the water, and usually a heater with a large number of passages whose cross-sectional area is small will transmit more heat than one having a few passages of large cross-sectional area.

A type of feed-water heater which in design follows the fairly widely adopted practice of employing relatively small-bore tubes for the heat transfer from steam to water is here illustrated.

This arrangement allows of the use of reasonably high velocities through the tubes, with subsequent increase in the rate of heat transfer. At the same time the straight tube lengths render periodical cleaning of sludge or scale an easy matter. This heater utilises a patented form of cover plate placed at the water-box end to avoid the difficulty usually experienced with the making of a double joint, or the removal of a large number of plugs, and the same principle has been applied extensively to condensers, heat exchangers, oil heaters and coolers.

Another recent introduction is an "auto-thermal" feed system of boiler feeding which provides for the discharge from steam-traps to the boiler, together with the necessary "make-up" feed at high temperature, with resulting economy of both fuel and feed water. The arrangement is entirely automatic as regards the return of condensation, while the control of the "make-up" feed is regulated by hand or automatically operated by the addition of a suitable float control device on the boiler. This arrangement is claimed to be more economical of steam than any pump and its cost of upkeep "practically nil". When used in conjunction with a good type of exhaust steam-feed heater



The "Dejector" Apparatus for Water Softening.

(Courtesy: British Boiler Accessories, Ltd., and John Thompson [Kennicott Water Softeners], Ltd.)

directly connected to the boiler feed tank the whole arrangement provides for utilisation of exhaust steam which is often wasted by discharge to atmosphere, as well as hot condensation from steam traps about the factory.

Boiler Mountings

Several recent types of valves and boiler mountings will be of interest on account of the variety of duties covered by these new items. A very successful parallel-slide link valve, a small bronze fitting which has an almost universal application as a quick-operating control valve for all kinds of liquids at low pressure, has now been adapted so as to provide a blow-off valve for small capacity vertical-type boilers working at pressures up to 150 lbs. per square inch. The parallel-slide action ensures easy operation and fluid tightness over long periods—two necessary characteristics of blow-off valves. The valve discs are connected to the valve spindle by a bronze link belt, the spindle rotating in a deep stuffing box, and opening or closing are performed by a quarter-turn of the box-key.

For the valve proper, on the outlet side, the disc and seat are of a special alloy which possesses extremely high resistance to erosion and deterioration, while (a very important feature) the design of the locking gland makes it impossible to remove the box-key except when the valve is in the closed position.

Small valves on steam lines usually give more trouble than the heavier equipment, and there are many factories where trouble is caused through valves failing to function properly when supposed to be either closed or open. The cheapest is frequently the most costly in the long run, and, as there are well-designed and strongly built valves on the market, valve troubles should not occur. Badly threaded tubes are also avoidable if use is made of reliable products, and can be a constant source of worry to both works' engineers and plant attendants. Again, where pipes have to be cut and threaded or flanges fitted, poor tools are not much use in the hands of the most skilled mechanic, and if nothing else is available the result is an unsatisfactory job and a dissatisfied mechanic. It is very necessary to provide the best material possible on all steam lines, both for the sake of safety and economy.

The latter point also should be borne in mind when ordering steam-heated pans, etc. Steel-plate work calls for skilful handling, from producing the metal to shaping and riveting in the desired formation, and the manufacturers engaged in this class of work work to a high standard of accuracy.

Steam Distributors

An interesting distributor has been designed for use on steam plant where a series of heat transfers is required. In this all condensate and dirt is removed from saturated steam by powerful centrifugal action in a steam purifier, which then distributes heat to subsequent processes in the form of clean, dry steam. The trap section of this apparatus will discharge to the hot well the condensate removed by the purifier section, and is capable of lifting such discharge through a height of 2 feet for every 1 lb. per square inch of pressure in the system. The purification and condensate discharge are simultaneous and continuous in the distributor, and can be duplicated after every absorption of heat into a process. Each process forms part of the steam flow, and heat is admitted at the desired rate, the rate of transference being high because the flow of heat through the process is rapid. A further point is that any heat exchange unit can be isolated without restricting the flow of heat to others.

Safety Valves

For high-capacity "Economic", "Lancashire" and vertical-type boilers a safety valve incorporating a high-lift feature has been introduced which ensures a discharge capacity of twice that of the ordinary type of valve, thus allowing a reduction in the number or size of safety valves required. The valve and seat are similar to those of the ordinary type of valve, with the addition of a piston on the spindle above the valve. When the latter commences to open, the discharging steam pressure lifts the piston against the collar on the spindle, and the additional load exerted on the area of the piston gives the extra lift, which has the effect of increasing the capacity, as stated above, within the allowed rise of pressure of 10 per cent. of the setting pressure. When the discharging pressure is reduced, the piston and valve return to the closed position, and the valve shuts down smartly and positively.

Economisers

From the standpoint of the practical engineer the first essential is that his plant shall operate at a good level of efficiency for long periods without constant attention and maintenance. In an economiser this means that the internal and external tube surfaces must remain reasonably clean under working conditions, that the pressure joints must remain tight under the additional stresses resulting from temperature changes, and that deterioration of the tubes by corrosion must not occur. Furthermore, it must not be a difficult or awkward business to examine an economiser internally and externally, since the Factories Act of 1937 lays down that such an examination is compulsory at least every fourteen months (two of which are "grace" months), and no economiser which cannot be thoroughly examined in *all* parts complies with a strict interpretation of the Act. Lastly, an economiser should be reliable and consistent in performance; it should not impede the draught unnecessarily, nor should it require constant adjustment and attention to make it function properly. The economiser is an important part of the steam generating plant, but its value is greatly enhanced if it gives continuous service with minimum maintenance.

One of the latest types is the horizontal gilled tube economiser. It has the external "diamond" form of the tube body, and extensive trials of many different shapes seem to have justified this selection; staggered tubes of diamond form possess the self-cleaning property in a high degree. The tubes are provided with rectangular gills, which minimises the possibility of soot deposits on any portion of the heating surface, while heavy flanges are fitted with through bolts, not studs. Another prominent feature is that there are no jointing flanges in contact with the gases, all pressure joints being external to the gas chamber, and all gas passages are intercommunicating, thus providing free gas flow and enabling the gases to spread over the whole of the heating surface, the maximum amount of which is provided by the use of rectangular gills.

Furnace Settings for Water-Tube Boilers

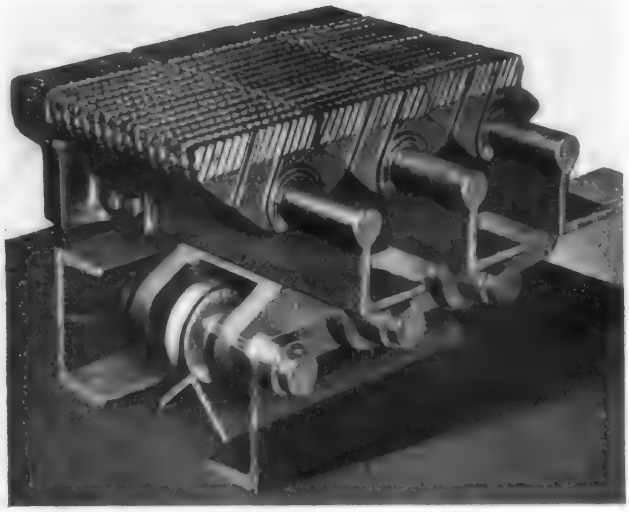
Recognition of the fact that the efficient utilisation of fuel is largely dependent on a suitable furnace in which to burn the fuel has called for particular attention to the most satisfactory design and construction of furnaces for water-tube boilers. Extremely high temperatures are created, and these call for the use of not only the best of refractory materials, but also for highly skilled labour, if maximum service is to be secured.

Water-Cooled Furnaces

Water-cooled furnaces are now becoming standard equipment for water-tube boilers and are very efficient for cooling the side walls when these are designed for high rates of heat release. In one type the tubes are wholly or partly covered by refractory material held in place by studs welded to the tubes. The stud-tube water wall is becoming extensively used because this construction costs less to instal and maintain than earlier arrangements of block-covered furnace walls.

Feed-Water Regulators

The feeding of a boiler should be done regularly and continuously, both in the interest of safety and economy. It is not uncommon, particularly on small boiler installations, to find that a fireman is called upon from time to time to do other jobs apart from firing, and it is often that water levels are allowed to get dangerously high or low. On jobs of this kind the water is frequently pumped up to a high level and the feed then cut off until it is at the other extreme—dangerously low. From all points of view this is wrong; the feed pumps and the feed valves should be so adjusted, if possible, to supply sufficient water to the boiler to keep the normal working level. In many cases, probably the majority, it is not humanly possible. For this reason a regulator has been designed automatically to control feed-water supply. The illustration shows one fitted to a Lancashire boiler; but they can be fitted to large batteries of boilers, while the author's experience of them with large water-tube boilers working at high pressure confirms the claim that they work satisfactorily on boilers working up to 450 lbs. per square inch pressure.



Chain Grate Stoker.

(Courtesy: Bennis Combustion, Ltd.)

Mechanical Stokers

These power-operated devices for feeding fuel to and driving grates are recognised as being almost indispensable in most boiler-houses, and there have been introduced many ingenious pieces of mechanism to carry out their particular job. For the water-tube boiler chain grates in some form are generally made use of. Chain grate failures have given boiler-house engineers anxious times; those concerned in their design, realising this, have paid increasing attention to the fact that satisfactory boiler performance depends largely on the reliability of the stoker mechanism to stand up to heavy rates of combustion without fear of mechanical breakdown.

Latest designs avoid altogether the possibility of mechanical stresses being carried by the surface castings, and also allow the surface castings to work at a much lower temperature than previously. This should ensure their longer life and thus minimise their out-of-commission time due to mechanical breakdown and replacements. It is interesting to note that the front-end tension device, which was a common feature of older types of mechanical stoker, has been replaced by equipment which automatically provides tension by the "lay" of the chain itself. The gear-box, too (of the eight-speed type), has been given attention, the various gears being cut from special alloys. A mechanical stoker can usually be designed to meet any specified conditions.

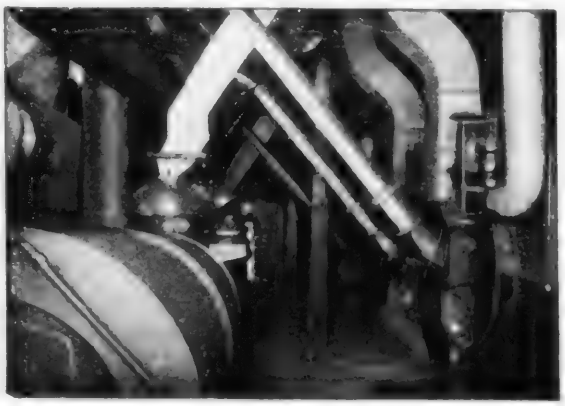
An automatic stoker, which has been introduced to provide a means of automatically feeding coal to any type of furnace or boiler consuming small quantities of coal up to 1,200 lbs. per hour, should be of interest to all who require a machine for small boilers for heating purposes, or for heating furnaces for various processes in food manufacture. In this apparatus the coal is fed from the hopper to the fire by means of a worm, provision being made for the rate of feed to be exactly regulated to the demand for heat. The coal-feed worm is driven by an electric motor through a gear-box, and the motor also drives a fan which can be regulated to give efficient combustion, the air supply being delivered through tuyères surrounding the fire. Pressure or thermostatic control can be provided to regulate automatically the coal feed to the furnace, according to temperature or pressure required.

Pulverised Fuel

Pulverised fuel, which is now used in several large industrial plants, has not become so generally used in smaller installations as is the case in America. A number of large power stations in this country have found that the prejudice which existed fifteen or twenty years ago was to a large extent without justification, and subsequent practice has shown that the chief difficulties which were anticipated have been overcome.

This method of boiler firing represents the latest practice in combustion engineering. With it the highest practical evaporation is obtained from any given boiler, and at the same time a higher standard of efficiency is maintained than is the case with the older forms of firing. To take a practical example, the 30 feet by 8 feet 6 inches Lancashire boiler usually produces from 6,000 to 7,500 lbs. of steam per hour when fired by hand, and from 8,000 to 9,000 lbs. of steam when fired by mechanical stokers. If converted to a system of pulverised coal firing, it is possible to steam continuously at a rate of 12,500 lbs. of steam per hour, and to meet peak loads of 15,000 lbs. per hour. A brief description of the equipment will illustrate the method by which high efficiency is both obtained and maintained.

Raw coal is fed to an air-swept tube mill by a speed-controlled feeder; in the pulveriser the coal is reduced to an extreme fineness, 1 cubic inch of coal being reduced to about 40,000,000 particles, whereas in hand or stoker firing 1 cubic inch of coal presents a surface of 6 square inches. When pulverised to the fineness stated, each of the individual particles enters the zone of combustion with its adequate measured supply of oxygen in the form of carrier air, resulting in rapid and complete combustion. The result is to burn small coal under conditions similar to those obtaining in gas firing, and as much ease of control is possible as in the latter. In addition, load fluctuations are followed almost instantly, labour costs are reduced to a minimum, and raw coal costs considerably reduced. By the use of pulverised coal a given steam load may be produced with a greatly reduced quantity of raw coal.

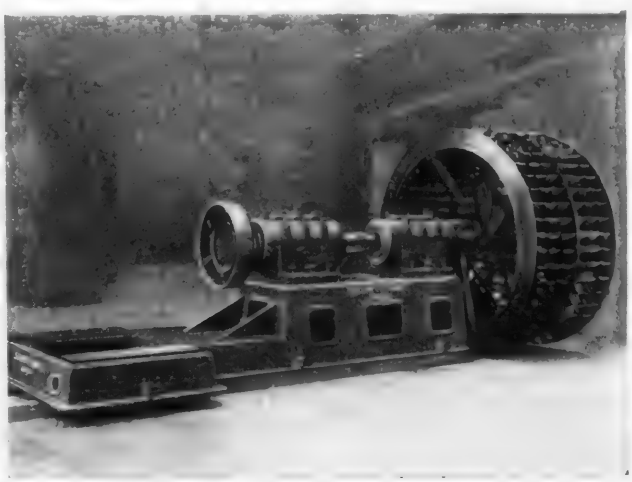


Kennedy Air-Swept Tube Mills.

(Courtesy: The Sheepbridge Coal and Iron Co., Ltd.)

Mechanical Draught

Although mechanical draught has been in use in connection with boiler plant for many years, there are numerous factories which do not possess this equipment and where its introduction would be effective, not only in smoke prevention, but would increase the effective capacity of the boilers at present in use. Now that boilers are difficult to obtain, the installation of a suitable induced-draught fan will frequently increase steam



A "Multivane" Wheel of a Draught Fan working on a battery of five 30,000 lbs. per hour Water-Tube Boilers.

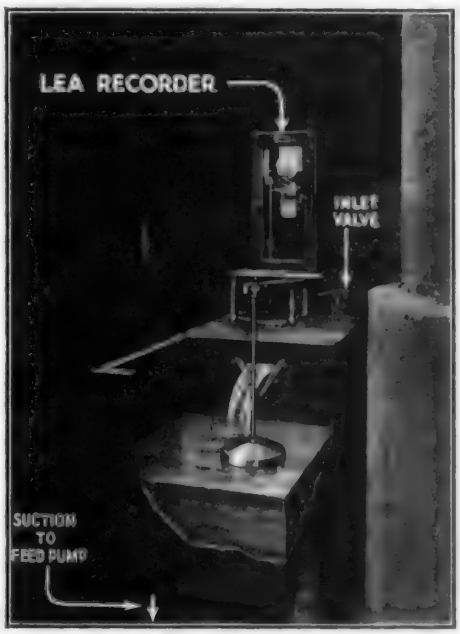
(Courtesy: The Sturtevant Engineering Company, Ltd.)

output by 25 per cent. Alternatively, as a result of the proper use of the air control which a fan can provide, a given weight of steam can be generated at a lower cost. The illustration shows the wheel of a draught fan working on a battery of five—30,000 lbs. per hour water-tube boilers. In use the wheel is, of course, encased. The runner is fitted with corrugated blades, and this type of fan is suitable for use with gases at temperatures as high as 700° F., and for water gauges up to 3½ inches on induced draught. By the use of mechanical draught, coal consumption can be reduced to its lowest figure for the particular type of boiler in use.

Water and Coal Meters

The measurement of water evaporated into steam is essential if boiler-house costs in any factory are to be kept at the minimum, and it is only by keeping a continual check on the "water evaporated per pound of fuel consumed" that a finger may be kept on the pulse of boiler-house efficiency. For many years reliable meters and recorders for dealing with water and coal measurement have been produced, and a recent type of water meter should prove of considerable value in the boiler-house and for many other purposes. This recorder is "guaranteed to produce records which are claimed to be within 1 per cent. of absolute accuracy, by weight, and engineers will appreciate that the **V** notch is the main feature in the apparatus. The installation of a water meter is not costly, and they may be had to deal with large or small boiler plants under most conditions of boiler feeding.

Coal-measuring apparatus (which can be fitted to either Lancashire-type or large water-tube boilers) is being used in many large power stations, where economical steam production is imperative.



A recent type of Water Meter.

(*Courtesy: The Lea Recorder Co., Ltd.*)

Steam Traps

Most factory engineers realise the importance of disposing of all water in steam lines and jacketed pans, etc., and endeavour to provide a satisfactory system of trapping to meet their particular conditions. Some prefer to use large traps at a considerable distance away from each other, while others instal smaller traps with less distance between them, all of which discharge the hot water into one common return pipe to be used elsewhere. There are many types of traps available, and it is generally the case that the traps selected for use are those the design of which is sound and suggests minimum need of care for maintenance and at the same time operate easily as well as efficiently. There is one feature which must be looked for when deciding what class of trap to use for any given duty; operation should always

High-Pressure Steam Trap.

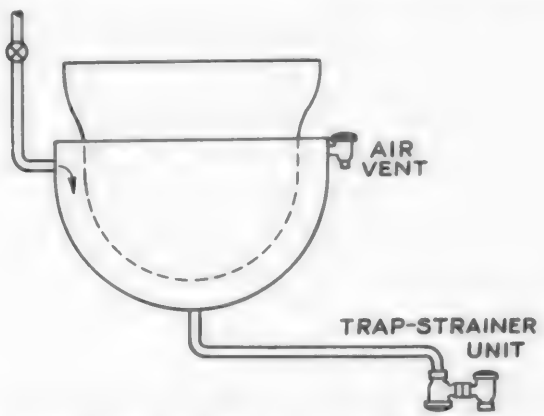
(*Courtesy: The Drayton Regulator and Instrument Co., Ltd.*)

be positive and continuous, while simplicity of construction and operation should be sought for, and, as there are traps which are so designed as to avoid need of a "by-pass" (the trap itself acting as a by-pass when necessary), these are worthy of consideration.

Manufacturers who generate steam at high pressures will be interested in a new forged-steel steam trap which is available in three classes for pressures up to 400, 600 and 900 lbs. per square inch. The body and cover for these high-pressure traps are forged from picked billets of ample section for the pressures for which they are designed. The buckets are of solid drawn stainless steel, and the traps are provided with heat-treated nickel chrome valves and seats, and appear to be in every way suitable for the duties for which they have been made.

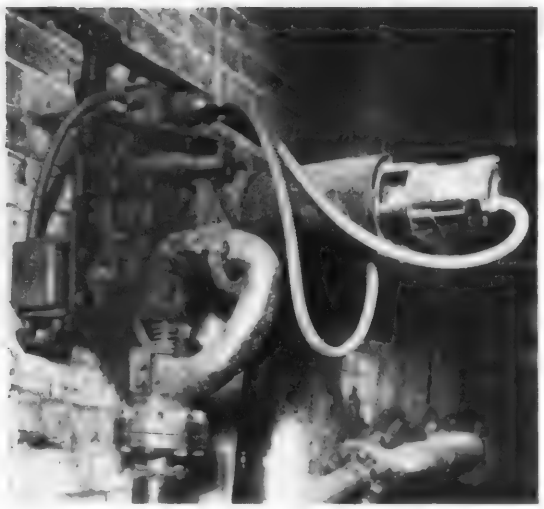
Back-Pressure Turbines

Back-pressure turbines are not as commonly used as they might be to provide power as a by-product. The actual saving which can be effected is shown as an instance in the case of a cleaning and dyeing factory which has utilised this means of securing cheap power. This works uses (on an average) 15,000 lbs. of steam per hour at 30 lbs. per square inch for boiling and heating. The whole of this is supplied by a 200-kilowatt back-pressure turbo-generator working with steam at 160 lbs. per square inch from Lancashire boilers. With normal working hours the yearly cost of coal amounts to about £2,750, equiva-



Trap Strainer Unit for Slow Boiling Pans. Low Pressures up to 40 lbs. per sq. in.

(*Courtesy: Spirax Manufacturing Co., Ltd.*)



Soot-Blowing Equipment.

(*Courtesy: British Thomson-Houston Company, Ltd.*)

lent to about 1·33 pence per kilowatt hour. If electricity were purchased at ¾d. a unit, and the required amount of steam provided by a boiler working at 40 lbs. per square inch, the total annual costs would be at least £4,000 a year. The difference in working costs—£1,250—represents almost the whole cost of the plant. In this case any surplus exhaust steam, due to fluctuation in load, is automatically passed to a low-pressure system at 3 lbs. per square inch, and, on the other hand, any deficiency is made good direct from the boilers.

Soot-Blowing Equipment

This has long been used on most types of boilers, and is particularly effective on water-tube boilers on account of the usual designs lending themselves to fitting of satisfactory devices for dealing with soot. Nevertheless, there are many boilers in operation (some in food factories which have recently been seen by the author) where this soot removal is still done by the old-fashioned method of using a steam lance by hand—not an efficient method, as well as being expensive in labour. Electrical operation of mechanical soot-blower heads is a money-saver, and no boiler-house should be without this apparatus. One satisfactory scheme for dealing with soot has as its essential components an electric motor with speed-reducing gear and control equipment for operating the motor automatically. Star-wheels and operating studs on each head cause a varying number of operations to be made before the blower-heads come to rest. The heads are controlled by a cubicle on the floor of the boiler-house (the front of the cubicle being divided into panels corresponding to the number of heads) and a master panel. A push button on the master panel causes the whole of the heads to be operated in sequence, each head being started immediately the previous one ceases operation. Any individual head may be operated alone by means of a change-over switch on the master panel and its appropriate push button; lamps on each of the head panels give visual indication of the apparatus in motion.

The conditions under which soot blowers work render them subject to failure through buckling and subsequent jamming of the jet-pipes, but this scheme provides audible warning if any motor comes to rest with steam blowing through the jets, a red lamp on each panel indicating which head has stopped. If a head fails the next one starts up automatically, and the sequence is continued.

Boilers

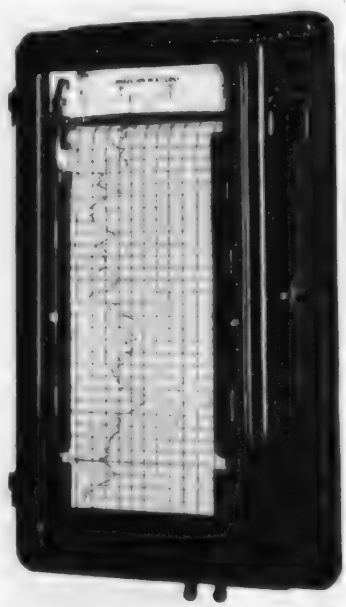
Only those people who have actually seen the care taken in choosing the right class of material for boiler plates which are exposed to the weakening effects of corrosion, and to intense heat, can appreciate fully the need for purchasing from reliable boiler-makers. Their efforts have resulted in the design of many types of steam generators, particular attention being given to safety to withstand the various working pressures as well as to the ability to transfer the heat given to them to the water which is to be evaporated. Each class of boiler has its own distinguishing features, such as the Lancashire, Economic and water-tube boilers. Of these, some firms manufacture all types, whilst others concentrate on one particular design.

Engine and Pump Lubrication

This is, so far as large plant is concerned, almost always of the "forced-feed" variety when oil is the agent for minimising frictional heat. When dealing with grease which is placed in cups, the human element is relied upon to adjust the pressure as required. Various types of grease-cups are in use, amongst which is the "spring-feed" system of lubrication, which appears to call for little attention when once it is given the necessary grease through the charge-gun supplied for that purpose.

Steam Meters

The use of steam meters for minimising steam consumption at processing plant is becoming more generally recognised, and the author has seen a number of works' engineers astonished by the economies which have been secured as a result of the intelligent use of this class of apparatus. Only too often does its use show that for years machines have been wasting steam and that measurement of steam consumption for a given unit of product, if recorded, is a reliable form of indication. These are now manufactured for almost any working conditions, and by their use any waste of steam can be traced and eliminated.



Chimney Heat Loss Recorder.

(*Courtesy: Elliott Brothers [London], Ltd.*)

Dust-Catchers

One particular nuisance which has caused much worry for food manufacturers is the discharge of soot and grit from chimney-stacks. A number of firms have been giving this problem their attention during the past few years, and various designs of "dust-catchers" have been produced. Where trouble of this nature is being met, treatment can be procured which will at least reduce grit emission to a minimum for the particular working conditions.

Electrical plant manufacturers have been well to the fore in searching for, and finding, improved methods of protecting circuits and equipment. Auto-transformers and motor starting gear have been given special attention, in spite of the abnormal conditions prevailing, while at the same time every effort is being made to meet demands for repairs and renewals, as well as the supply of plant usually stocked.

THE MILLING INDUSTRY

PROGRESS IN 1940

A. J. AMOS, Ph.D., B.Sc., F.I.C.

DURING THE YEAR under review both the milling and baking industries have had to face numerous unusual difficulties, and have had to adapt themselves to various abnormal conditions which have arisen as a result of the war. It is very gratifying to note, however, that both industries have dealt very ably and efficiently with their problems and have certainly played their part in maintaining both quantity and quality of the staple foodstuff of the country—bread.

Definite progress has also been made in cereal science, but naturally milling and baking chemists in this country have not been able to devote as much time to academic research as they did during peace-time, while there has naturally been no records available for some months of investigations made on the Continent. The major proportion of the reported work has naturally, therefore, come from America.

Availability and Allocation of Wheat

Since the early days of the war the millers of this country have had to deviate considerably from accepted practices. In peace-time they were in the habit of buying on the open market those types of wheat which, from their own knowledge, supplemented by laboratory reports, they knew to possess the characteristics suitable for the type of wheat grist they had in mind. They were thus in a position to plan grists which were economical, but which, at the same time, would yield a well-balanced flour of the strength they required. At the outbreak of hostilities, however, the Government took charge of wheat importations and appointed various Port Area Grain Committees, each of which was responsible for the allocation of the imported wheat available for the region over which they had jurisdiction. A miller in need of wheat was obliged to apply for it to the Port Area Grain Committee for his district, indicating the class of wheat required—*i.e.*, strong, "filler" or weak. The Port Area authorities would allocate to the miller in question the most suitable wheat they had available, but often it was not just the type that the miller would have acquired had he had his usual free choice. There has thus been much less scope for the judicious compounding of grists than existed prior to the war. The position has been aggravated by the limitation of the varieties of wheat which have been imported. The majority of the wheat has been Manitoba (No. 1 and No. 2 grades), together with some Durum, Plate (mainly the Rosafe type) and Australian. This is in contrast with the pre-war period when, at various times, there were available in addition lower-grade Manitoba, Hard Winter, Northern Spring, Indian, Soft White Pacific, French, Lithuanian and wheats from the Danube Basin, such as Roumanian, Bulgarian, etc. As a result of the wheat position millers have been obliged to employ in their wheat blends much higher proportions of good-grade Manitoba wheat than was the custom in peace-time. Before the war it was not unusual to find grists containing from 35 to 45 per cent. Manitoba, but following the declaration of war this proportion jumped to 60 per cent. or more. Consequently, flours generally have exhibited an increase in strength and certainly in water absorption compared with the pre-war standard. The arrival a few months ago of some shipments of Vancouver Manitoba, which proved to be distinctly inferior in baking quality to the wheat from the Atlantic side, and the availability of New Crop English wheat, led to a tendency for certain flours to show some reduction in strength and stability, but the general standard of flours is, nevertheless, still distinctly above that of peace-time.

Although the wheat available has been restricted in variety, there has been no shortage of quantity. The Government gradually built up a security stock of wheat prior to the outbreak of war, and by the autumn of 1939 the nation was favourably situated with regard to supplies.

Wheat Harvests and Prices

Earlier this year it was feared the shortage of moisture in U.S.A. and Canada would adversely affect the crop yield. Later on in the summer months, however, there occurred timely rains, which brought about a remarkable recovery, so much so that, despite the poor start, the Canadian crop proved to be the second largest on record.

The severe drought which has been experienced in Australia has had a markedly adverse effect upon the yield, and the crop is expected to be less than half that harvested a year ago.

In the Argentine unfavourable weather conditions prevailed at seeding-time, but despite this a substantial acreage was seeded, and the crop is expected to be satisfactory and well in excess of that of last year.

It is, of course, difficult to make an estimate of the 1940 European wheat harvest, owing to the scarcity of reliable data, and the margin of error involved in a forecast is consequently exceptionally large. It would seem, however, that the total European production is in the region of 15 to 20 per cent. below that of last year. In England a reduced yield has been counterbalanced by an increased acreage, and it would seem that there is no call for disappointment concerning the first war-time harvest.

Statistics suggest that the world wheat surplus for the 1940-1941 season will be the largest on record. The total European demand for imports will, as a result of the blockade, be less than in peace-time, so that the unsaleable world surplus is likely to be extremely great. This has led to consideration being given in some oversea wheat-exporting countries to a reduction of acreage. If, of course, we were able to bring the war suddenly to a successful conclusion, the position would be completely altered and this exceptional reserve of wheat would be of great value.

There has at no time since the commencement of the war been any alarming rise in international wheat prices. The unfavourable crop reports which were current in the spring of this year led to an upward tendency in prices, and this move, together with the wastage and increased consumption of bread arising from the war, encouraged investment. The confidence of investors was, however, badly upset by the invasion of Norway and Denmark, followed by the capitulation of Holland, Belgium, and France, and this resulted in a fall in the price of wheat; at Chicago and Winnipeg the price declined by 20 cents a bushel, and a little later by a further 10 cents a bushel. The position became sufficiently serious to necessitate drastic measures being taken to arrest the decline.

The Milling Industry

Whereas in the Great War of 1914-1918 the milling industry was not subjected to Government control until the country had been at war for almost three years, the industry was controlled immediately on the outbreak of the present hostilities. Numerous regulations have been imposed upon the industry, but the two main decrees to which it has been subjected from the beginning are the necessity of obtaining all wheat by application to the respective Port Area Grain Committees and the limitation of flour types to one straight-run grade (National Straight Run, or, in short, N.S.R.) of fixed extraction. The current regulation fixes the extraction at 72 per cent., calculated on total products. In passing it is interesting to note that recently the authorities in Eire have made it obligatory for millers to mill all the flour to an extraction of 75 per cent., calculated on the wheat going to the first break rolls.

Suggestions have arisen from various sources that the production of flour of considerably higher extraction should be enforced in order that a greater quantity of flour may be obtained from a given weight of wheat, and also that the flour produced may contain a greater proportion of vitamins and minerals. It is, however, often forgotten by those making such suggestions that, in addition to bread, meat, eggs, and particularly milk, are also necessary foods. Owing to the lack of shipping space there is a marked scarcity of imported animal feeding stuffs—so much so that they will be rationed from the New Year—and an increase in flour extraction with the consequent concomitant reduction in wheatfeed production would diminish still further the supply of animal rations, and probably necessitate a further reduction in the head of stock maintained by breeders.

Probably the most striking development which has occurred in the industry during the year is the recent Government decision to make compulsory the incorporation in flour of synthetic vitamin B_1 together with a calcium salt. As this project has been fully discussed in this journal (September, 1940) by a number of well-known authorities, no consideration will be

given to it in this review. It seems most likely, however, that the scheme cannot be put into operation much before the summer of 1941.

Since the commencement of the war, security stocks of flour have gradually been accumulated in stores throughout the country. If such stocks are to be of value, it is essential that the conditions of storage should be such that the flour will not readily undergo any form of spoilage. There are several types of deterioration to which flour is liable if not stored correctly, and these were discussed in a recent article by the present author (*The Miller*, October 7, 1940). It was pointed out in that article that one factor which had a retarding effect upon the onset of the possible deteriorative changes was a low moisture content in the flour, and a regulation now exists which limits the moisture content of flour intended for security stocks to 14 per cent. The Ministry of Food have recently decided that the method of determining the moisture content shall be that laid down in the Wheat (Examinations and Analyses) Byelaws, 1939, Second Schedule, in which the flour is heated in a well-ventilated oven at 100° C. for five hours, the drying being performed in a receptacle of specified size.

The present author also suggested that the authorities should definitely give consideration to the practice of applying periodically to security stock flour a test which would reveal any tendency to the onset of deterioration. Recently a committee has been appointed by the Ministry of Food in order that the best method for detecting any tendency for spoilage to occur can be decided upon and, if practical, put into operation.

The Research Association of Flour Millers has been collaborating with the Pest Infestation Laboratory of the Department of Scientific and Industrial Research in an investigation designed to reduce infestation and loss in stored wheat and flour.

It was realised early in the war that it was not unlikely that some damage would be sustained by mills at the ports as a result of aerial attack, and arrangements were accordingly made that any such loss of milling capacity could be compensated for immediately. A body known as the Purchase Finance Co., Ltd., was formed, and it leased certain inland mills which were reasonably modern but which had been closed down. As expected, a certain amount of damage has occurred to port mills, and the Purchase Finance Co. are now operating a number of their "reserve" mills as a counter-measure.

FOOD ANALYSIS

PROGRESS IN 1940

D. W. GROVER, B.Sc., A.I.C.

NO REVOLUTIONARY advances can be recorded in the analysis of foodstuffs during the past year, but a steady accumulation of facts and information about analytical methods continues to be published.

General and Physical

The Kjeldahl method for the estimation of nitrogen in organic material has yet again been modified, the object being to decrease the time of digestion. Stubblefield and De Turk[1] review the existing modifications and conclude that selenium is not as satisfactory a catalyst as copper, tending to give low results. The method they propose is to use sulphuric acid (25 c.c.), potassium sulphate (10 gms.), ferric sulphate (6 gms.), mercury (0·6 gm.). The period of digestion is reduced from 150 to 30 minutes as compared with the Kjeldahl-Gunning-Arnold method, and identical results are obtained.

Another very frequent determination, the ash, has been studied by Wichmann,[2] who confines his attention to materials with alkaline ash. He stresses the advantages of standard conditions and suggests 525° to 550° C. as a suitable temperature. Carbonation or sulphation of the ash do not yield results of any added value. Tight-fitting aluminium covers to the platinum dishes greatly reduce weight changes during weighing. Other general advances in technique of interest to food investigators are described by Cohan and Hakerman,[3] who describe a rapid turbidity method for the determination of emulsifying efficiencies and give an extensive bibliography; Gooden and Smith,[4] who apply Carmen's specific surface equation and develop a self-calculating apparatus for the measurement of particle size based on air permeability; Alter and Thomas,[5] who apply surface active agents to prevent the flotation and creeping of precipitates, particularly calcium oxalate. Tergitols are suitable and should be added after precipitation, otherwise crystallisation is prevented. These agents may also help in stabilising colloidal precipitates when these are estimatd turbidimetrically.

Dairy Products

The phosphatase test for pasteurisation effectiveness has come in for some further attention. Fasken and McClure[6] find a slightly modified test suitable for milk pasteurised at 143° F. for 30 minutes. Cream, on the other hand, may give a positive test, even if effectively pasteurised, owing to higher initial phosphatase content. The converse holds for skimmed milk. The sensitivity of the test is estimated by Filipek and Fioretti[7] to be 1° F. in temperature, or 5 minutes in holding time. Barkworth[8] has studied the treatment of controls and concludes that they should be tested at once, or, alternatively, the milk stored in a refrigerator overnight. Treatment whereby the test is started one day and completed the following morning gives high readings. The same author has made a critical study of the determination of the acidity of milk. The importance of sufficient phenolphthalein is stressed, and at least 30 mgs./100 c.c. is recommended. The British Standards Institution have given their attention to the bacteriological examination of butter,[10] and specify methods and apparatus for sampling, diluting, and for differentiation and enumeration of the various organisms. The tests are intended as a basis for comparison with the commercial properties of butter; users of the methods are invited to communicate their findings to the Institution. In this connection Vandaaveer and Wildman[11] find correlation between the mould mycelia count in butter and the occurrence of decomposition flavour and the acidity of the cream churned. A high count in butter shows conclusively that decomposed or unfit cream was used. The plate count of milk has come in for some criticism at various times, chiefly owing to its unreliability. The American Public Health Association has modified the medum used in its official test, and Nelson[12] has found this modification has decided advantages. It gives a higher count with larger colonies and also a smaller increase when plates are incubated at 32° C. instead of 37° C.

Eggs and Egg Products

There has been little progress during the year in the analysis of egg products. The position as regards estimation of egg content of foods continues to be unsatisfactory. Mitchell[13] has examined the chemical methods available for the detection of decomposition of eggs, and finds the increase of volatile acid the best indication—very much inferior to observation of smell and appearance, however! Grover[14] has reviewed the evaluation of dried egg albumen.

Meat and Fish Products

Present regulations make a reliable method for estimating the meat content of sausages more desirable than ever, but natural variations in the composition of meat render remote the probability of arriving at an accurate figure. Jones[15] outlines a system based on the estimation of carbohydrate and cellulose material (non-fatty solids less protein and ash), which gives an approximate figure for cereal filler by multiplying by two. This enables a figure for meat protein to be estimated and the quantity of lean meat calculated from a table of water/protein ratios for various meats. This plus the fat gives the percentage of meat. Kerr[16] proposed methods for estimating dried skimmed milk in sausages by determination of calcium and lactose, the latter after selective fermentation. These methods are not described in detail, however. The detection of decomposition in meat and fish is the subject of two papers. Keller and Möller[17] have

examined a method for meat (Walkieweicz's) depending on reaction of an extract with mercuric chloride. They find it sensitive, but liable to interference by presence of much connective tissue, fat, blood or pig or horse flesh. The freshness of herring and brisling is correlated by Aschehoug and Vesturhus[19] with the bacterial count. Five hundred thousand organisms per gram accompany a strong flavour. Stale fish have from $1{\cdot}2 \times 10^6$ per gram and are considered unmarketable. The average for good quality herrings is from 1,000 to 100,000. A manometric method for the estimation of nitrite in solutions and tissues is described by Brooks and Pace,[19] depending on reaction with amidosulphonic acid (NH_2SO_3H, prepared by bubbling SO_2 through hydroxylamine hydrochloride solution), and measuring the volume of nitrogen evolved. Sodium nitrite concentrations of 2×10^{-5} gms. per c.c. can be estimated $\pm$ about 1 per cent.

Fruit and Fruit Products

The most important contribution to the analysis of fruit products during 1940 is that of Hinton and Macara[20] on the analysis of some jam fruits and the determination of the fruit content of jams. Figures are given for seeds and stones (if present), insoluble solids, soluble solids, acid (free, combined and total), lead numbers, pectin and *p*H of many samples of jam fruits, including some imported fruits and pulps. Comparison is made with a previous publication by the same authors. The minimum and average figures are not greatly changed in most cases. These figures are applied to the estimation of the fruit content of jams, with particular attention to the lead number which differentiates between the various fruit acids. Where several fruit constituents are determined in a jam it is not necessary to use minimum figures for all these constituents for the corresponding fruit to arrive at the fruit content.

Fats and Oils

The component glycerides of naturally occurring fats continue to be investigated, mostly by Hilditch and co-workers. The fats include the body fats of the pig,[28] palm oils[29] and butter fat.[30] Analytical methods have also received some attention. Hilditch and Murti[31] have concluded that the thiocyanogen value is empirical in nature, and the determination requires further study before it can be made a reliable means of determining linoleic and linolenic acids. McCutcheon,[32] in his study of the reaction of Wijs' solution with purified unsaturated acids and esters, concludes that the method consistently gives iodine numbers close to 98·8 per cent. of theoretical. The American Chemical Society's Committee on the analysis of fats has made minor revisions of the standard tests recommended.[33] For the examination of butter fat (Ghee) the Reichert value is frequently unsatisfactory, and it can with advantage be supplemented by a neutralisation value, proposed by Hawley.[34] An extensive investigation of the aldehydes produced during fat spoilage is contributed by Taüfel and Klentsch.[35] The aldehydes are classified as epihydrin aldehydes, which give a positive Kreis reaction, and "free" aldehydes, which are detected by von Fellenberg's fuchsin-sulphurous acid reaction. By substituting fuchsin by Döbner's violet differentiation between high- and low-molecular weight aldehydes is possible. Further differentiation is possible owing to the varying solubility of the compounds formed in the fuchsin-sulphurous acid test.

Sugars and Sugar Products

The estimation of sugars has continued to receive some attention. Britton and Phillips[21] have made a potentiometric study of the titration of both alkaline tartrate solutions of copper and potassium ferrocyanide with dextrose. A sudden change of e.m.f. is observed at the end point. They conclude that the exact proportion of alkali· tartrate and copper sulphate in Fehling's solution are not of great importance, although the oxidising power of the copper oxide is influenced by the alkali content. It is confirmed that the use of methylene blue as an internal indicator (Lane and Eynon titration) is theoretically sound both for copper and ferrocyanide methods. Pickett[22] has studied the use of the Shaffer-Somogyi reagent, which contains potassium iodide and iodate in addition to alkali/tartrate/copper sulphate. This reagent gives rather high results, as would be expected from its composition. It has the selective action of neither Fehling's solution nor alkaline iodine. The methods available for the estimation of sugars in confectionery products have been reviewed.[23] A method for the analysis of barley sugar is proposed by Whalley.[24] This depends on determinations of sucrose, reducing power to Fehling's solution, polarisation and soluble solids. Characterisation of aldoses by the preparation of the benzimidazole derivatives of their corresponding acids is suggested by Moore and Link.[25] Aldo-monosaccharides are oxidised in methyl alcohol by means of hypoiodite. The acids produced are condensed with *o*-phenylenediamine. The derivatives formed have advantages over ozazones as a means of characterising the sugars. It is hoped that the work will be extended to include aldo-disaccharides. The detection of gums in foodstuffs is the subject of a paper by Hart.[26] Interfering substances are removed, the gums hydrolysed by acid and the liberated sugars estimated with Benedict's sodium citrate/copper sulphate solution. In mayonnaise, cheese and ice-cream, trichloracetic acid is used for the final removal of proteins; the gum is precipitated with alcohol to purify. As little as 0·08 per cent. of locust seed gum can be detected. Sodium alginate is not detected by the treatment, as alginic acid is precipitated by trichloracetic acid. Tannic acid is therefore used to precipitate the proteins to detect this. Methods are being examined to separate starch and gum by enzymatic methods. An example of the microbiological examination of sugar is contributed by Clark and Tanner,[27] who describe the technique for the examination of sugar and starch for thermophilic organisms causing flat sours in canned products.

Cocoa Products

The estimation of pectic acid as a means of arriving at the amount of shell in cocoa products is discussed by Winkler.[36] The method, published in *Methods of Analysis*, A.O.A.C., 1940, gives promising results and agrees, on the whole, with the older method. The pectic acid is estimated as the ammonium salt. Results on a number of samples of chocolate liquor were between 0·05 and 0·11 per cent., whereas shell gave between 3·63 and 4·02 per cent. A modification in the extraction of cocoa alkaloids is proposed by Harral[37] whereby the theobromine is converted to caffeine by methylation with methyl sulphate before extraction. This greatly reduces the number of extractions required, owing to the greater solubility of caffeine in chloroform. Lockwood[38] describes a standardised technique for the microscopical estimation of particle size in chocolate. The material is packed into a $\frac{5}{64}$-inch hole in a metal plate, thus providing a measured quantity, which is suitably diluted and mounted on the microscope slide.

Fermentation Products

The determination of the volatile acid in distilled spirits has been engaging the attention of the official agricultural chemists in the U.S.A. The present steam-distillation method has proved difficult to carry out with accuracy. Beyer[39] proposes determination of total and fixed acids, the latter after evaporation of the volatile acids. The difference is, of course, the volatile acids. A very different method is described by Schicktanz and Blaisdell,[40] who estimate the volatile and fixed acids from potentiometric data. The volatile acids are mostly homologues of acetic acid and have higher dissociation constants than the fixed acid, of which tannic and gallic acids are taken to be typical. The volatile acids are empirically assumed to be the equivalent of the titration up to *p*H 8·5 and the fixed acids from *p*H 8·5 to 11·0. Results in fairly good agreement with the steam-distillation method, and more easily reproduced, are obtained. The analytical distinction between spirit and artificial vinegars is the subject of a note by Manley.[41] Lower minimum values for ash, nitrogen and phosphoric acid must be accepted for spirit vinegars than those proposed by Edwards and Nanji. The ester value is of little value, and the oxidation value remains the most sensitive test.

Flavouring Substances

An improvement[42] in the official method of the A.O.A.C. for the estimation of vanillin in vanilla extracts gives a higher yield. Previously a considerable fraction of this constituent was absorbed during clarification with lead acetate. The new method provides for clarification from a more dilute solution and removal of excess lead in the same flask, thus avoiding a filtration. The results are some 20 per cent. higher and much nearer the truth. Ethyl vanillin (bourbonal) is detected in amounts as small as 13 mg. in 100 c.c. (0·5 gm. per gallon) in vanilla extracts by a method described by Chenoweth.[43] The extract is dealcoholised, clarified, etc., as for the estimation of vanillin, dissolved in 6N. hydrochloric acid, oxidised with hydrogen peroxide and extracted with benzene. A blue coloration indicates ethyl vanillin. The test is claimed to be specific. Wilson[44] has made a further study of the identification of flavouring constituents. His *m*-nitro-

benzene hydrazide method continues to give satisfactory results for the estimation of β-ionone in raspberry flavours, and a method for the determination of coumarin based on condensation as coumarin-*p*-nitraniline is described. The suitability of the B.P. standards for lemon oils as an indication of their value in foods has been discussed.[45] The consensus of opinion is that, while citral content fails to indicate flavour intensity or value, it does serve as a valuable guide to the distiller of terpeneless oil, who is able to rely on a reasonable yield. Two addenda dealing with flavours have been made to the B.P. 1932. The first introduces an innovation : the organoleptic testing of the pungency of capsicums. For example, *Tinctura capsici* is tested by diluting 2 ml. to 100 ml. and 1 ml. of this to 50 ml. with 5 per cent. sucrose solution. Three ml. of this swallowed all at once should produce a distinct sensation of pungency in the throat of at least two out of three persons. The other *addendum* includes purified oil of bitter almonds, specifying source and constants, including a method for the determination of aldehydes. Komm and Flügel[46] describe a colorimetric method for estimating diacetyl, acetoin and butylene glycol, utilising the reaction of the first with alcoholic dinitrobenzoic acid. Acetoin is converted to diacetyl by oxidation with ferric hydroxide in 40 per cent. caustic soda. Butylene glycol is oxidised by bromine followed by ferric hydroxide. The abstract in the *Analyst* gives full details. A method for detecting saccharin is adopted by Reindollar,[47] comprising features of several known procedures. It is extracted with petroleum mixture, converted with phenol sulphonic acid to phenolsulphonphthalein, and identified by the red colour produced with caustic soda.

Preservatives and Dyestuffs

Formic acid cannot be completely volatilised by steam distillation, but the addition of toluene or benzine (100° to 110° C.), as suggested by Grossfeld and Payfer,[48] enables 95 to 97 per cent. to be obtained in the distillate. Similar results are obtained with acetic and propionic acids, but lactic, butyric, benzoic and valeric acids give progressively lower yields. Precautions are taken which avoid interference from caramelisation of the sugars, which produces some formic acid. The abstract in the *Analyst* gives full details. It is interesting to note that the official steam-distillation method of the A.O.A.C. for sulphur dioxide in beer and wine is found to be far less satisfactory than the Monier-Williams procedure.[49] An acidimetric estimation of boron, replacing indicators by an electrometric technique, is described by Wilcox.[50] Separation of dyestuffs into groups by means of their reaction with ferric hydroxide is the subject of a paper by Eichler.[51]

Metals and Other Inorganic Constituents

The determination of heavy metals in foodstuffs continues to attract attention. The A.O.A.C.[52] introduce minor changes in their methods for antimony, arsenic, copper, fluorine, lead, mercury and zinc. A new method for copper, using triethanolamine to replace ammonia, is claimed by Yoe and Barton[53] to possess certain advantages. A modification of the dithizone method for lead is preferred by Fischer and Leopoldi,[54] who also review recent work on the subject. Interfering metals are kept in solution as complex citrates and cyanides, and oxidation is prevented by means of hydroxylamine hydrochloride. The lead is extracted by means of dithizone in chloroform, converted to the chloride and finally estimated in the "mixed colour" technique. Slight excess of dithizone is added and an equal amount then treated as the standard, lead solution being added until a colour match is obtained. Howe and Mellon[55] have investigated the coloured complex formed with ferric iron by salicylaldoxime, and conclude that it is suitable for determining small amounts of this metal. For the successful application of dithiol to the estimation of tin Giacomi[56] concludes that the tin must be isolated, freed from ammonium sulphate, citrate and hydrogen sulphide water. He recommends wet combustion with sulphuric acid and potassium sulphate. Nitric acid must be avoided, as it gives rise to insoluble metastannic acid. Cobalt is determined in foods by a method described by Sylvester and Lampitt.[57] The metal is extracted from other constituents of the ash by converting it into its dithizone compound and extraction with chloroform. Organic matter is destroyed with perchloric and sulphuric acids and cobalt estimated by McNaught's method (nitroso-R-salt) colorimetrically. The cobalt content of food varied from 0·001 part per million in milk and 0·004 in tea to 0·33 and 0·41 part per million in shelled cocoa beans. The method adopted by Ford, Kent-Jones, Malden and Spalding[58] for the micro-determination of bromine in foodstuffs consists of protected ashing, oxidation with potassium hypochlorite, liberation of iodine from potassium iodide and titration with N/100 sodium thiosulphate solution. A distillation method for the estimation of iodine is described by Fraps and Fudge.[59] The charred material is oxidised with chromic acid, converting any iodides to iodic acid. This is reduced to iodine with phosphorous acid, and the iodine distilled in an all-glass apparatus. The iodine in the distillate is estimated colorimetrically. A new method for the estimation of phosphates is that of Allen,[60] depending on the colour produced with amidol and ammonium molybdate. The colour may be extracted from turbid solutions with isobutyl alcohol. Both the volumetric and colorimetric methods of the A.O.A.C. for the estimation of phosphates have come in for some study.[61] The former is interfered with by sulphates and silicates, which give rise to high results. For the colorimetric method Gerritz states that the salt concentration should be controlled for greater accuracy, and gives details of an improved reagent. The method is examined with great thoroughness.

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ROAD TRANSPORT OF FOOD

PROGRESS IN 1940

Events of the year just past, in so far as they have contributed towards facilitating the distribution of food products by road, notwithstanding difficulties due to the war

H. SCOTT HALL, M.I.A.E., M.I.T.A.

PETROL rationing, and means of ameliorating the conditions which have resulted therefrom, has been the topical note amongst users of road transport for the past twelve months. Vehicles engaged in the distribution of foodstuffs have been, perhaps, affected the most because of the undeniable national urgency of such traffic.

Conservation of Petrol

The need for conservation of petrol supplies has, therefore, been fully realised and various methods of meeting the situation devised. There have been two main lines of endeavour : pooling of traffics and co-operative working amongst otherwise competitive concerns and the utilisation of alternative fuels.

Of the former there have been local and national examples. The biggest and possibly the most successful effort is that which is exemplified in the Wholesale Meat and Provisions Transport (Defence) Association, which has been responsible for the distribution of meat from slaughterhouses and for the delivery of livestock from markets to those slaughterhouses. In the latter part of the work another organisation, Traffic Movement, Ltd., organised by Associated Road Operators, Ltd., took a leading part. Both organisations were formed and are controlled by practical operators; their success is ample justification for the plea that all such enterprises should be put in the hands of experts and relieved from official interference.

Pooling of Vehicles

The pooling of operators' vehicles has indeed helped considerably in the collection and delivery of food. A case in point is the organisation for the transport of cocoa, chocolate, boiled sweets and allied products. To meet Government requests for a reduction in petrol consumption and economy in the use of transport generally, the principal manufacturers of these products decided that much could be done if local deliveries to customers were pooled. Overlapping of services was minimised by co-operation, and long-distance road transport reduced so far as possible. A few of the larger manufacturers had already established railhead depots throughout the country to which goods could be sent in bulk by rail, and from which their road vans distributed to shops. Those concerns have pooled their facilities and placed them at the disposal of the trade. Instead of handling only their own goods, they include those of their competitors. The scheme has worked most satisfactorily and some two million miles of movement of vehicles have been saved as well as nearly a quarter of a million gallons of petrol.

That is a typical example. Executives of food-manufacturing concerns viewed the matter from the national standpoint. They have, in that spirit, entered into these schemes for pooling of traffic and found ways of getting round difficulties in the way of co-operation with competitors which in peace-time would have been described as insuperable.

Alternative Sources of Power

In the same way, too, they have directed their energies to experiments with alternative sources of power and made considerable use of them. The first line of approach to the problem of conservation of fuel was provided by the principal makers of carburettors, who immediately established what may be called economy services, the purpose of which was to help users of their instruments to obtain maximum mileage per gallon, even although the economy thus effected might be achieved at the expense of some loss of power and diminution in average speed. Considerable advantage has been taken of that practical method of economising in liquid fuel.

The development in the use of alternative sources of power has been considerable. The electric vehicle has been utilised more freely; town, or coal, gas is being employed, usually at normal pressures, carried in balloon-type bags on the top of the vehicle, and occasionally, but rarely, at high pressure conveyed in steel cylinders. Producer gas as an alternative has become quite popular, and, when vehicles have been available, recourse has been had once more to the use of steam wagons.

The Electric Vehicle

The electric vehicle has a sphere of usefulness in which it is unequalled by any other form of road transport. Its value was coming to be realised before the war broke out. Present conditions have stimulated the imagination of users, and many have found, to their surprise, that, by ignoring the electric vehicle, they have for some time been missing an opportunity for economising in the cost of running their transport and distributing their goods.

The feature of the battery electric vehicle which makes it such an attractive proposition in these times is, of course, the fact that it is independent of imported fuel, because our main electricity supplies are obtained from generating stations at which coal is the fuel used. It has not yet been found necessary to ration either coal or electricity. Moreover, the once-despised but now fervently welcomed Grid System for the distribution of electric current makes electric power available practically everywhere.

The legitimate sphere of the electric vehicle is well defined and strictly limited. It is suitable for operation over routes the total mileage of which is well within the range of the battery with

A Carter Paterson van powered by British Vehicle Producers Ltd. helps the Emergency Food Industry.

which it is fitted. Any attempt to use the vehicle as an emergency or even odd-job machine is doomed to failure. If that mistake is not made, the electric vehicle is most satisfactory and particularly economical.

It is sometimes suggested that the restricted mileage of the electric vehicle might easily be overcome by the simple expedient of fitting larger batteries, since the mileage per charge depends upon the size and capacity of the battery. It is true that, by increasing the size of the battery, the radius of operation can be proportionately increased. On the other hand, any increase in battery capacity involves an addition to the unladen weight of the vehicle and, since it is designed for a maximum gross laden weight, the pay load is correspondingly reduced. The possible operating mileage of the vehicle, therefore, depends to a large extent on the pay-load capacity required, and it has been found that, bearing in mind the importance of first cost and economical operation, the limit is from 25 to 30 service miles, that providing for eight starts and stops per mile.

Comparison of Costs

The first cost of an electric vehicle, including the battery, is high, as compared with the petrol vehicle of the same pay-load capacity. The economy of the electric lies in the low cost of current per mile. A simpler and fairer method of comparing the two types on a basis of cost of operation is to eliminate the cost of the battery from that of the vehicle and regard it simply as fuel. This can be done if the battery is regarded as being replaceable after three years and if its cost, together with that of the current consumed during the period, is expressed as a cost per mile. On such a basis, and reckoning an average mileage of 30 per day, the comparative costs of an electric and petrol one-ton van are in the proportion of two to three.

When it is desired to cover a longer mileage per day than that available from one charge of the battery, that object can be achieved by the use of spare batteries, provided that the mounting of the battery in the chassis is such that the exchange can quickly be effected. A little extra mileage can be had by giving the battery a boost during the middle of the day. That is not, however, a completely satisfactory method and the additional mileage is small.

Present-day traction batteries require surprisingly little attention, and if they be given an equalising charge, at low current, for three or four hours, after they are fully charged, about once a fortnight, and are topped-up with distilled water at the same time, little else is required. Like all batteries, they should be kept clean and all traces of corrosion on the terminals removed. During the equalising charge the voltage of each cell should be taken, and on completion of the charge the gravity of the acid in each cell should also be checked. These precautions are required to keep a check on the cells so as to pick out at an early stage any that may show signs of falling off in performance. Subject to these precautions a life of four to five years for the battery is not unusual.

Town Gas as Fuel

The mileage per charge of a vehicle on town gas at normal pressures is even more limited than that of the electric vehicle. There is not room for a large fabric container; a fair-sized one will hold about 300 cubic feet of gas, and that is equivalent only to 1¼ gallons of petrol, about 10 to 12 miles of running with quite a small van. Much greater mileages could be effected if the gas was available at high pressure, but the difficulty there, which is likely to prevail for at least the duration of the war, is that there is a shortage of steel cylinders for containing the gas, so that they are practically unobtainable. In effect, therefore, we may almost dismiss town gas from the list of suitable alternative fuels for the distribution of food from manufacturers.

Producer Gas

Turning now to producer gas, there can be no denying that the event of the year in that connection was the introduction of the Government-sponsored plant. It was designed to be specially suitable for the conversion of motor vehicles, in an emergency, from using liquid fuel to the employment of home-produced fuel. That design was based on available proprietary plants, selecting those which had been regarded, as the result of their performances, most favourably. It is, in effect, a piece of apparatus which will enable road transport to continue to operate, notwithstanding the shortage of liquid fuels. No pretensions to super-excellence of performance have been claimed for it on other grounds. It met, in the beginning, with a good deal of criticism, chiefly, it must be confessed, from competitors. It has, nevertheless, justified its existence and, although not, of course, faultless, has more than fulfilled the expectations of its sponsors. About forty concerns are now manufacturing the Government plant, and there are, in addition, some half a score or more types of producers on the market, all of which can be relied upon to give good service. Their teething troubles have been overcome. There are some thousands of vehicles on the road using producer gas as fuel and giving satisfaction to their owners. Even that outstanding problem of the effective use of producer gas, the filtration of the gas so as to clear it of dust and other impurities, has been solved. In cases where success has not been achieved, the failure can generally be traced to the fact that the plant has not been given proper care and attention. The driver is the weak link in the chain. It is undoubtedly a fact that men who are willing as well as capable of appreciating the fact that when using producer gas they have to supervise the making of the fuel as well as the running of the vehicle are necessary for this work.

It may be advisable here to add a note of warning, that it is futile to expect from producer-gas vehicles quite the same performance as when using petrol or oil fuel. There is a certain loss of power, there is some additional maintenance required, and in some cases a diminution of loading space available on the vehicle because of the room taken by the plant. Against these disadvantages, however, can be set a considerable saving in the cost of fuel and the fact that, for the period of the war at least, there is no likelihood of the fuel being rationed or supplies curtailed.

A really helpful gesture from the Government, giving considerable advantage and encouragement to the use of producer gas, was the series of concessions in respect of weight and speeds available to vehicles when using that fuel. The restriction of speed to 20 miles per hour of vehicles the unladen weight of which exceeded 2½ tons is modified in the case of producer-gas-engined vehicles, and does not apply until the unladen weight exceeds 3 tons. The maximum gross laden weight of the larger types of vehicle, which is normally 12 tons in the case of a four-wheeler, 19 tons in the case of a six-wheeler, and 22 tons in the case of an eight-wheeler or a vehicle and trailer, is increased by 15 cwt. in the case of the four-wheeler and by a ton in the others when producer gas is used.

There are also some concessions in respect of taxation, which need not be set out in detail, but which place the gas-producer type of vehicle in a slightly more favourable position as regards the tax to be paid than the corresponding machine using petrol or oil fuel.

The Steam Vehicle

The position as regards the steam vehicle is, unfortunately, that none is being made. Quite a number, which had been taken out of service prior to the war because existing conditions were not favourable to their employment, have been put upon the road again, and they are making a helpful contribution, on the one hand, to the problem of providing adequate road transport, and, on the other, to diminishing the consumption of imported fuel.

Fruit Juices

(*Continued from page* 19)

New Zealand, too, has taken up the subject with great activity, and Mr. L. W. Tiller, who, with Mr. Davis, has studied in the Fruit Product Section at Long Ashton, is conducting a series of investigations concerning the processing of New Zealand apples into juice. The Government has sponsored production in one or two centres and has introduced a system of licences, which must be obtained before production can be commenced.

Australian chemists are now actively engaged on the subject of utilising apples, pears, plums and citrus fruits, and quite a number of firms are already in production on a large scale.

South Africa, India, Ceylon, Kenya, Rhodesia and Nigeria are all in process of developing fruit-juice factories for their fruits, and Long Ashton is in constant touch with those concerned, especially in the case of apple juice.

But the Dominions' problem during the war will become *our* problem when it ends, and the intensity with which they now view their present difficulties should be taken as an indication of the importance of a continuation of the existing investigations at Long Ashton, so that suitable processes and products, attractive alike to consumers and manufacturers, will be available when the post-war years arrive.

THE VITAMINS

PROGRESS IN 1940

A. L. BACHARACH, M.A., F.I.C.

ANY ATTEMPT to make an "annual review" of a rapidly advancing branch of science involves the difficulty of knowing where to begin. Publication dates give far too arbitrary a base-line, especially to those who know what curious and apparently irrelevant circumstances may determine the actual day on which the record of some advance first reaches the scientific public. Rather, then, than attempt to confine this survey to all vitamin advances, and only those, that occurred between midnight on December 31, 1939, and the same hour twelve months later, it is proposed to select a few that have been clearly consolidated during or about the period in question, and to do no more than refer in passing to the better-known and well-established vitamins, such as A, B_1 (aneurin), riboflavin and C (ascorbic acid).

Vitamin D

Of these respectably orthodox vitamins it is, however, necessary to mention one—namely, vitamin D, to give a general name to what we now recognise as a group of antirachitic substances, of which at least two, probably three or four, and possibly several more, occur in Nature. The chemistry of these substances, and of the steroids of which they are the irradiation products, need not be discussed here at length, especially as they have been considered *in extenso* not only in the standard books on sterols (Fieser,[1] Sobotka[2]), but also in many special reviews (*e.g.*, Friedman,[3] Bacharach[4, 5]). But there is one issue of clinical—and veterinary—importance to which the year has seen important contributions. Calciferol (vitamin D_2)—the vegetable vitamin D, an irradiation product of calciferol, present naturally in certain irradiated plant materials, such as cocoa shell and ergot—and vitamin D_3—an animal vitamin, irradiation product of 7-dehydrocholesterol, one of the most important contributors, if not the main one, to the antirachitic activity of fish-liver oils—have been for some time held of equal potency in their effects on the rachitic rat, each having an activity of 40 million international units per gram. It has also been known that, curiously enough, the vegetable vitamin has relatively little effect on the bones of the growing chick, which needs for normal osteogenesis either ultra-violet irradiation or a supply of vitamin D_3.

This year there has been worked out a satisfactory method, susceptible to proper statistical analysis, for assaying cod-liver oil and other sources of vitamin D_3, whether mixed with vitamin D_2 or not, and expressing the results in terms of an agreed unit.[6]

The year has seen published further very convincing, and officially sponsored, evidence that the two forms of vitamin D are identical in their action on human beings, infant or adult; these conclusions were reached by Morris and Stevenson[7] for rachitic infants and by Himsworth and Maizels[8] for an adolescent parathyroprivea. The year has also seen the publication of an interesting volume by Reed, Struck and Steck,[9] in which is included, among much other useful information and some interesting speculations, the fullest account so far available of their treatment of arthritic conditions with massive doses of vitamin D. Here, again, calciferol and vitamin D_3 seem to be indistinguishable in effect.

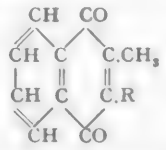
Vitamin K

The most recently established fat-soluble vitamin, K, is now known to occur naturally in at least two forms: vitamin K_1, a plant product and apparently much the more widely distributed, has the constitution 2-methyl-3-phytyl-1:4-naphthoquinone. Vitamin K_2 has not been synthesised with certainty; it was first isolated from rotted fish-meal, and has now been prepared crystalline and shown to differ from vitamin K_1 in that the phytyl group is probably replaced by two farnesyl residues "fastened head to tail".[10]

Both forms of the vitamin appear to be about equally active in restoring a normal level of prothrombin in the blood of chickens that have developed hypoprothrombinæmia on a vitamin-K-deficient diet. Still more effective, weight for weight, is the so-called "synthetic analogue of vitamin K" (it is most misleading and strongly to be deprecated that this analogue has actually been referred to as "synthetic vitamin K" by some authors). This is simply 2-methyl-1:4-naphthoquinone.

The corresponding hydroquinone and its simpler esters, especially the acetate, are equally active, and certain water-soluble derivatives—phosphate and sulphate—have also been found active.

THE "COAGULATION VITAMINS."



2-Methyl-1:4-naphthoquinone ($C_{11}H_8O_2$): R = H

Vitamin K_1 ($C_{31}H_{46}O_2$):
R = $CH_3.CH:C(CH_3).[(CH_2)_3.CH(CH_3)]_3.CH_3$

Vitamin K_2 ($C_{41}H_{56}O_2$).
R = $CH_3.CH:C(CH_3).CH_2.[(CH_2)_3.CH:C(CH_3)]_3.CH_3$

All these substances, as well as certain other related substances of considerable theoretical interest but less practical importance, are effective in the treatment of two clinical conditions. In obstructive jaundice, interruption of the flow of bile appears to inhibit absorption of any vitamin K present in the food, and to lead to hypoprothrombinæmia with a resultant increase in blood-clotting time that enormously increases the risk of surgical removal of the obstruction. This risk has been largely eliminated by pre- and post-operative use of methyl naphthoquinone, which has almost completely replaced the more expensive and less convenient vitamin itself, natural or synthetic. Again, "neo-natal hæmorrhage"—bleeding of the new-born—has been found strongly correlated with a low blood prothrombin level, and is amenable to treatment, either of the mother shortly before labour or of the baby immediately after birth, with methyl-naphthoquinone. A certain percentage of neo-natal mortality is undoubtedly due, directly or indirectly, to hæmorrhage, and the general use of this new "super-vitamin" will infallibly save infant lives.

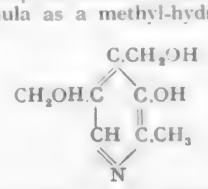
Methyl-naphthoquinone is actually, weight for weight, more effective clinically than vitamin K, doubtless due to its more rapid absorption, as well as to its lower molecular weight; the function—or at any rate the effect—of the phytyl (or di-farnesyl) group in the 4-position of the vitamin molecule appears to be that of increasing its lipophilic nature and thus retarding its absorption. Such retardation is, of course, generally undesirable in therapeutic treatment.

Vitamin E

Little new is to be reported of tocopherol (vitamin E). Several papers[11, 12, 13] on its use in the treatment of muscular dystrophies, based on their apparent resemblance to the paresis and paralysis produced in rats, rabbits, guinea-pigs and dogs by vitamin-E-free diets, have aroused a good deal of interest, though there is by no means general acceptance of the proposed procedure.

Vitamin B_2 Complex

The "vitamin B_2 complex" continues to undergo cracking at the hands of the vitamin chemist. First riboflavin, then nicotinic acid were separated and allotted their specific nutritional rôles, closely linked with their indispensability to certain cellular oxidation systems. The division of the rest of the complex into "filtrate factor" and "eluate factor" and the identification of the latter with Györgyi's vitamin B_6, for which Kuhn proposed the now generally accepted name "adermin", led to the establishment of its formula as a methyl-hydroxy-dihydroxymethyl-pyridine—



Vitamin B_6 (Adermin: "eluate factor").

This composition has been amply confirmed, synthesis having been achieved by two different groups of workers,[14, 15] using different routes. The part played by adermin in the nutrition of the rat and the chicken has been thoroughly well established, but its essentiality to man remains at present still a matter of presumption by analogy. Curiously enough, it has been reported as of benefit in the treatment of those very dystrophies for which tocopherol (vitamin E) has been tried; there is, of course, no *a priori* reason why both claims should not be true, but further evidence is urgently needed.

The "filtrate factor" has yielded at least one of its components, which has been shown to be the pantothenic acid of R. J. Williams—an essential growth factor for certain yeasts and other micro-organisms, including many bacteria. Its formula is now known to be

$$CH_2OH.C(CH_3)_2.CHOH.CH.NH_2\,CH_2.CH_2.COOH$$

Pantothenic acid.

It is, in effect, an amidic condensation compound of β-alanine with α:γ-dihydroxy-β:β-dimethyl proprionic acid; this latter compound has such an unexpected "shape", and seems so unlikely to be part of a physiologically reactive molecule that specially critical attention has been given to the claim for the biological essentiality of its compound with β-alanine, itself a β-amino-acid previously known to occur naturally only as part of the molecules of anserine and carnosine.

Whether the whole of the physiological properties of the "filtrate factor" reside in its pantothenic acid content seems doubtful; there are conflicting claims for the ability of pantothenic acid to counteract the achromotrichotic (artificial greying of the hair) effect of a filtrate-factor-free diet on piebald rats. It should be added that natural pantothenic acid is a *d*(+) compound; the synthetic substance has been prepared by more than one route and is, of course, always racemic. Its activity on rats, chicks and micro-organisms appears to be half that of the natural compound. The naturally occurring *dextro* form has been separated from the racemic mixture by resolution of the quinine salts.[16]

Other Vitamins

Work on vitamin P (the hesperidin group of flavanone glycosides) continues. Zacho[17] claims to have confirmed Szent-Györgyi's original work, in which he produced in guinea-pigs a vitamin-P deficiency distinct from vitamin-C deficiency, though Zilva and Moll independently and later Szent-Györgyi himself failed to do so. This question, like those of the present relation between vitamin A and the chemical changes undergone in the retina during dark adaptation, the nature of the pyruvic acid decarboxylation-oxidation reactions undergone in animal tissue in the presence of carboxylase and aneurin pyrophosphate, the rôle of nicotinic acid in combating sulphanilamide toxicosis, and whether the "essential unsaturated fatty acids" are indeed as essential to man as they are to the rat—these are but a few of the many fascinating problems that await further work and final solution.

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CORRESPONDENCE

Vitamin B_1 in White Bread

The Editor.

DEAR SIR,

In spite of Mr. H. Horace Ward's reasoned comments on this subject, and even in face of his courteous observations on my own views, I stick to my guns. The Accessory Food Factors Committee has suggested the 1-lb. loaf as a basis for estimating the vitamin B_1 intake of the adult manual labourer. The figures suggested by the Committee for the amounts present are higher than those assumed in my comments, published in your September issue. They therefore tell against my argument, so that I may legitimately make use of them. On that basis the vitamin B_1 contents of 1 lb. of different breads are approximately as follows:

	Mg.	*International Units.*
White	0·35	100
85 per cent. extraction	1·10	300
Whole meal	1·60	450
"Ministry of Food"	0·75	250

Even if we take 500 units as the daily amount necessary for health—and some authorities consider this to be at least 50 per cent. too low—the consumer of the "Ministry" loaf has to find another 250 units in the rest of his food, which will also need to supply from 1,500 to 2,500 calories per day. A pound of potatoes will give him another 450 calories and another 150 units of B_1, if none is lost in the cooking—a very big "if". Could he be sure of an adequate daily ration of other foods relatively richer in vitamin B_1—liver, bacon or ham, tomato—he might get safely up to the required intake, but present economic and political tendencies make this increasingly unlikely. With a whole-meal loaf, or even with the 85 per cent. extraction loaf advocated by the Accessory Food Factors Committee, he would be safe; alternatively, the addition of aneurin to the proposed "Ministry" loaf would need to be doubled.

Yours faithfully,

Glaxo Laboratories, Ltd. A. L. BACHARACH.

The Editor.

DEAR SIR,

I have read with interest Mr. Bacharach's calculations used to back up his contention that the proposed addition of aneurin is insufficient. This opinion is, of course, dependent entirely on the minimum daily intake required, and the figure has continued to jump from 300 units suggested by the League of Nations Technical Commission to a possible 750, "according to some authorities".

However, from the figures which he quotes the fortification proposed adds 150 units, which is something like a 50 per cent. increase on a calculated average intake, bringing it to 450 units, which is certainly a little low on the 500 basis, but does not justify the suggestion that the quantity which the Ministry propose to add should be doubled.

It appears that Mr. Bacharach advocates the 85 per cent. extraction loaf, and on the figures quoted there is some justification, but I am inclined to doubt the wide difference suggested in the table between the "Ministry of Food loaf" and that from an 85 per cent. extraction.

Moreover, even on these figures it would not achieve the same vitamin content as "white flour bread" fortified with double the proposed quantity of aneurin.

All calculations are based on average figures for vitamin B_1 intake, but the fact that those who most need the supplement will eat the most bread avoids the necessity for adding any excess on the calculated figures. For this reason the choice of flour as the medium for supplementing the natural resources of the vitamin is a happy one.

It is probable, too, that work on the production of yeast of higher B_1 potency will be stimulated, and I believe that a certain increase from this source can be anticipated.

Yours faithfully,

Aynsome Laboratories, Grange-over-Sands, Lancs. H. HORACE WARD.

THE CONFECTIONERY INDUSTRY

PROGRESS IN 1940

R. L. KENNY, B.Sc., F.I.C.

THE RATIONING of raw materials at the outbreak of war presented a tremendous problem to the manufacturing confectioner, but it did not have such a disastrous effect as might have been anticipated. His technical advisers were very soon able to convince him that such a reduction in his sugar allowance did not necessarily compel him to decrease his output correspondingly, provided he possessed sufficient initiative. Two chief methods were introduced to achieve the desired objective. The first of these was effected by the elimination of the high sugar users such as Fondant Creams, and the second step taken relied upon the part replacement of the sugar by other non-rationed raw materials.

It was only natural, therefore, that there was a greater demand for corn syrup, since the manufacturer saw a ready means of preparing lines such as Fondants with a higher proportion of this ingredient. The results achieved produced a slightly lower grade and less sweet product, but because the glucose content was not raised too high the Fondant could subsequently be cast into starch and used for centre cream preparation without causing too much sweating of the centre.

Rationing of Corn Syrup

It was not long, however, before the Government found it necessary to enforce a rationing of corn syrup, and at this stage a different type of problem presented itself to the technical chemist. Corn syrup has been almost universally used in confectionery for the prevention of graining, and the only suitable alternative available for this purpose is invert sugar, which has sucrose as its starting point in manufacture and is, therefore, also on a strictly rationed basis.

As time went on other materials such as oils and fats also became difficult to obtain, and the manufacturer was compelled continually to readjust his ideas in order to cope with the new situation. In recent months a new type of difficulty has arisen, since the manufacturer has been cut off altogether from the supply of certain raw materials. Items in this category include fresh milk, cream, and condensed milk. The manufacturing side of the confectionery business is, therefore, now faced with the task of gathering together all the available raw materials and utilising these in the best possible manner, in order that there may be maintained as great an output as possible without reduction in quality. This problem is a very important one, and, while present conditions exist, on its solution will depend the ultimate success of the confectionery trade during the coming months.

Production Takes Up the Challenge

The following is an outline of a few of the methods adopted by the confectionery trade in order to overcome the innumerable difficulties which rationing has placed in its path. Let it be emphasised here and now that these restrictions have been accepted by the trade in general as being inevitable and a necessary contribution to the economic war effort of the country.

Production has realised that a direct challenge has been issued and must be accepted cheerfully in a real "will to win" spirit. Naturally, the new order of things has resulted in a large amount of experimental work being carried out in various departments. Such labours have not been in vain. By astute alteration in recipes the manufacturer has been able to introduce into certain of his confectionery products non-rationed materials. He has been faced with the problem of having to consider from one week to the next what basic raw material must decide his immediate production policy. At one time sugar may be the all-important ingredient, and then suddenly the scene changes before his eyes as fresh legislation is introduced, and he might then foresee that his position with regard to fats, for example, assumes a greater importance, and a new perspective is required. These changes have occurred in such rapid order that it has become extremely difficult for the confectionery trade to strike a correct balance and so preserve a current stock of all the essential raw materials.

Cutting Waste of Syrup

In all probability the initial step taken by manufacturers to combat the rationing of sugar was an attempt to cut waste of sugar syrups down to a minimum. Quite a few confectionery businesses in pre-war days were in the habit of discarding a certain amount of syrup which was sold to the brewing or other trades. Naturally enough, this practice could not be continued under present conditions, and it was necessary for almost every manufacturer to salvage this syrup for his own industrial requirements. One of the best methods adaptable for this purpose consists of a process involving clarification with animal charcoal and subsequent filtration through a suitable filtering medium. This process will be found extremely successful and can be carried out on an economic basis calling for only a very small initial plant outlay. The temperature of the syrup has to be controlled in order to prevent unnecessary inversion, and experiments have been conducted in order to ascertain the optimum condition with regard to the weight of charcoal necessary and the minimum time of contact required, since the aim of the manufacturer is to produce a clear syrup with the smallest quantity of charcoal and in the minimum amount of time.

A reminder has been given above to the effect that inversion of the syrup should not be allowed to proceed too far during processing. This, of course, only applies if the syrup is to be used ultimately in the preparation of confectionery, since the presence of considerable invert sugar would unbalance the recipe and prevent standardisation taking place. The author has found that an activated carbon with a pH approaching 7 should be used, in order to arrest inversion of the syrup. This precaution is recommended because it has been found in practice that if the carbon possesses a high acidity this property is transferred to the syrup with which it comes into contact.

If, however, such control is found to be difficult, it is a very simple matter to convert the purified syrup into invert sugar, which will find a ready use as the chief ingredient of the "Bob" syrup for the preparation of Centre Cream Fondant. Since, in this preparation, it is an advantage to encourage inversion to the greatest possible degree, an activated carbon with a low pH is recommended for the clarification process, because it has been learnt by experience that the short time charcoal is in contact with the syrup at a high temperature is sufficient to carry the inversion to a fairly advanced stage before any other method is introduced. In either case, therefore, no matter what the condition of the syrup, provided it is not too contaminated in flavour, it should be possible to utilise it to the very best advantage.

Bakery Problems

For any such survey as this to be complete it should perforce include mention of the bakery aspect, since the problems involved, particularly those concerning raw materials, are very closely allied to those of the confectionery trade. The baker has been faced with an additional difficulty because, although he has been rationed on raw materials, he has also been restricted as to the manner in which he may use those which are still available. The order prohibiting the use of fondant icing on the outside of cakes will serve as an example to illustrate this point. This has necessitated a large number of experiments on the part of the practical baker, with a view to producing a modified range of finished products.

The recent shortage of eggs has presented him with yet another problem, and has resulted in the introduction to the trade of a large number of egg substitutes. Since the majority of these do not consist of pure whole dried eggs, it is not usually possible for the manufacturer to replace the entire egg content in a cake by means of these substitutes. These powders, however, can be made to replace a certain proportion of the eggs previously used, but since their composition from different sources varies tremendously, great care should be taken in selecting the most suitable product. The baking test alone is not a sure guide; it is just as important that an analysis of these substitutes is available, and those firms which possess their own analytical laboratories will save themselves endless time and

waste of raw materials by eliminating a large number of unnecessary baking tests, and by submitting to practical experiment only those samples which have been proved by laboratory testing as being worthy of trial in a cake mixing. However, the final decision must rest on the results of the baking test, but any saving of raw materials which can be effected by keeping the number of such tests down to a minimum is obviously, in these times, a step in the right direction.

Confectionery Flavouring

It is interesting to note in which direction the difficulties have arisen concerning the flavouring of manufactured products. It has been established by almost unanimous consent that the most popular essences are those derived from the citreous essential oils. In this group may be included Lemon, Lime, Orange and Tangerine. Of these, Lemon Oil was by far the most common, but unfortunately the only two varieties were those imported from California and Sicily. This limitation in source of supply, coupled with the restrictions imposed upon importation, has resulted in the price of Lemon Oil soaring to an extremely high level, since the manufacturer has practically to rely only upon stocks available in this country. It is probable, therefore, that in the very near future there will be an endeavour in the confectionery trade to popularise concentrates which can be produced from our own home-grown fruit, and it is not unlikely that Blackcurrant, Strawberry and Raspberry flavours will find their way into lines in increasing quantities, particularly in the cheaper class of goods such as the high boiling range, where the manufacturer either cannot afford to use or else cannot obtain the citreous flavours.

Several large firms are now producing first-class true fruit concentrates of this nature by a process depending entirely on English fruit as the base, and as a consequence the price of such flavours has not been subjected to any large increase.

Packaging and Design

Another interesting trend on the confectionery side during the past year has been a simplification of pack and a standardisation of design. This is quite a logical sequence of events brought about by a shortage of board, and also by a certain limitation in the amount of labour available. In view of the steadily increasing prices of raw materials, it has been necessary for the manufacturer to cut his labour costs on any particular unit down to a minimum if he is to keep the price of the finished article at a figure comparable with the pre-war basis. There has been a growing tendency, therefore, to eliminate any processes which were merely indulged in by the manufacturer to obtain a presentation angle to his pack, and the last few months have seen the disappearance of all unnecessary wrapping materials.

A new order recently introduced concerning the labelling of packages has restricted the size of the label on any new pack to a maximum of 20 square inches. It has now become necessary for the manufacturer to apply a new presentation angle to his label, in order to use to the best possible advantage the limited space available.

Shelf Life of Confectionery

The shelf life of any particular confection is still one of the chief concerns of the food chemist. The term "shelf life", in this particular instance, refers to the length of time which a confection will retain its original perfection under normal storage conditions. The responsibility of the chemist has been eased somewhat by the fact that the majority of food products are now consumed very shortly after despatch from the manufacturer, and do not, therefore, require such a long shelf life as in the pre-war period.

On the other hand, however, it is not possible to obtain adequate supplies of the necessary protecting materials such as tin, waxed board, aluminium foil and moisture-proof transparent paper. The last of these items is still permitted for the very essential purposes of protecting the keeping qualities of foodstuffs, and the confectionery manufacturer has been able to introduce its employment along these lines in those cases in which he had in the past to rely upon foil or waxed proof paper. The confectionery trade as a whole has made a united effort, at the expressed wish of the Government, to eliminate altogether the use of transparent paper for presentation purposes only. This has resulted in an enormous economy, since in recent years the practice of wrapping all manner of goods in cellulose paper has increased to a very marked extent on account of the extra appeal which is obtained from the marketing point of view.

Invert Sugar

There is also a further very important factor which influences the shelf life of confectionery. It has been pointed out that the manufacturer has probably been compelled to make alterations in his recipes which have introduced different ingredients, and in this connection attention should be drawn to the possible substitution of invert sugar for corn syrup, or *vice versa*. These changes cannot be made without affecting the keeping quality of the finished product. This statement refers to the more hygroscopic nature of invert sugar as compared with that of glucose. It is a well-established fact that confections in the high boiling range prepared from a sugar-corn-syrup recipe exhibit superiority in shelf life over similar products prepared by the utilisation of invert sugar as the anti-graining agent. The example quoted illustrates the danger of the substitution of invert sugar for corn syrup, but the same principle is applicable to many other raw materials to a lesser extent.

There are various factors which influence the prediction of the keeping qualities of confectionery and make difficult an accurate estimate, if based only on the knowledge of the ingredients to be used. It is now, however, possible for the food chemist, armed with this knowledge, to be able to forecast approximate keeping qualities of any particular manufactured article, and in the author's opinion there is a very definite future for this scientific aspect, as applied to the manufacture of confections.

In the foregoing notes it has only been possible to mention a very small proportion of the problems which have arisen in the industry, but they may offer food for thought and convey a general picture of the difficulties with which the confectionery manufacturer has had to contend during the past year.

The industry in general is faced with trying times ahead, but the problems can and will be solved by the various units concerned displaying a real co-operative spirit, which is now more necessary than ever before.

WHAT GHEE REALLY IS

Milk, or cream from milk, is allowed to sour. The sour product is churned into butter, which is separated from the buttermilk. This butter usually has a high moisture content, since it is not worked. Often the butter is separated in such a consistency—owing to high temperature—that it cannot be worked. Sufficient of this butter is collected from successive churnings to merit a "ghee boiling".

There are two main steps in the subsequent ghee preparation and refining processes—namely, (*a*) the "boiling", and (*b*) the "heating" of the ghee.

The boiling of ghee consists of heating the above-mentioned butter directly over a fire until the butter-fat settles out and the water of the butter is completely boiled away. This may be done on a small scale in brass household vessels, or on a large scale in iron boilers. The moisture is first completely boiled away and the fat is then heated until the curd starts to brown slightly. This occurs at about 116° C. The temperature of heating in this process should not exceed 123° C. The solid curd is then allowed to settle while the ghee is cooling. The slight scum on the fat is skimmed off and the pure fat separated by decantation or ladling off. This is the ghee in crude form.

It has still to be separated from small quantities of curd. Country ghee is usually bought from the cultivators in the above-mentioned crude form and is subjected to a "heating" process in bulk quantities so as to purify it further and to blend it. This is done by melting the ghee and pouring it into larger boilers—according to the desired blend. It is then heated to a temperature not exceeding 80° C. with stirring. Then fine particles of curd are allowed to settle and the clear ghee is strained through fine cloth (muslin or linen) into the tins. The ghee is then ready for market in its refined form.

The boiling of ghee is an essential step, since it sterilises the fat, is the only way to obtain the maximum yield from the butter, and confers part of the aroma and flavour of slightly burnt curd to the ghee.

(*Indian Farming*, 1940, **6**, 284.)

FOOD MANUFACTURE INDEX FOR 1940

The 1940 index of Food Manufacture is now ready, and copies will be available to subscribers on receipt of a stamped addressed envelope. This envelope should be 10 inches by 8 inches to avoid undue folding of the Index.

FRUIT JUICES

PROGRESS IN 1940

VERNON L. S. CHARLEY, B.Sc.
(Fruit Products Section, University of Bristol Research Station, Long Ashton)

THE QUESTION of the production of juices from fruits has arisen both abroad and at home largely in connection with prevention of wastage both from glut crops and from the normal grading processes which have been a marked feature of the fruit-growing industry in recent years. The citrus juices of America were developed as a means of removing from the market enormous quantities of fruit of second-grade quality, and the success of this venture led the apple growers to extend the idea to their own crop as well. Consequently, the fruit industry in Britain was influenced by European and American experience and began to regard fruit juices as an excellent means of using up low-grade and surplus fruits from the ever-increasing acreages that were coming into bearing.

The research work at Long Ashton was started in 1932, and the developments in fruit-juice and syrup production that have taken place since that date have been fully reported in this journal. The process of making the country "juice-conscious" has commenced, and the production of fruit juices and syrups has shown a gradual but significant increase since that date.

Autumn, 1939

Then came the war—and with it a mature apple crop of cider, cooking and dessert fruit which was,

Framed in the prodigality of Nature.

At a first glance it may have appeared that the Elysian fields of Kent, Essex and South-West England had combined to meet not only a "long-felt want", but also a new and urgent demand for fruit products throughout the year to act as one component in a war-time dietary. But how different was the actual position! Very little extra pure apple juice could be stored on account of the impossibility of increasing the storage capacity (*i.e.*, the large steel tanks to hold juice under high CO_2 pressure) in time to make use of the crop. A considerable volume of apple juice was made, but its size bore no direct relationship to the size of the crop, and the fruit which might have been processed in a normal year when plant could have been obtained was allowed to waste. (This article is not concerned with the developments of concentrated apple juice and treacle, which arose as a direct result of the need to find a method of storage of apple juice in a form which would not raise serious problems over the storage vessels.)

Summer, 1940

The extremes of Nature were illustrated by the very heavy apple crop of 1939 and the short crop of soft fruits in 1940. The absence of imports from European sources intensified the shortage, and probably there was an absolutely negligible quantity of fruit which could reasonably be called "surplus" during the summer season. Those manufacturers who were relying on buying a few hundred tons of fruit at surplus prices were disappointed, and what fruit-syrup firm could afford to pay £60 to £90 a ton for black currants? At the higher price a clarified juice might well cost 12s. 6d. a gallon without any further processing. August, 1940, however, brought a reversal of the position with a heavy crop of plums, but in view of the restriction of imports on all kinds of fruits, including citrus, the greater part of the surplus plums were pulped and held over against a "fruitless day", perhaps in 1941 or perhaps in 1942. So, by a combination of circumstances due to Nature and the war, pure English fruit juices found no niche to fill in this year.

Autumn, 1940

The investigations on fruit concentrates carried out at Long Ashton in 1939 had created very considerable interest in food manufacturing circles, and it was clear that, given a good crop of apples in 1940, very large quantities of concentrate could be made and would find a ready market. But surely,

Nature wore one universal grin,

for the apple crop was short, both in the culinary and dessert markets, as well as in the grass cider orchards of the West. Cull apples were sold at prices between £5 and £10 per ton, and the concentrates produced therefrom were costed at much higher prices than the former year when fruit was purchased at prices as low as £2 to £3 per ton. There was a veritable scramble for apples; the cider industry, experiencing such exceptional demands for their produce that a form of rationing was being imposed on their customers, added to the difficulty by taking a certain proportion of cull apples, and by the middle of December only a few odd lots of apples were still for sale. Consequently there has been no notification of any marked increase in the production of fruit juices, although the concentrate story, despite the difficulties of supplies, has passed another milestone and is now gathering impetus. A further feature of the season's work has been the interest shown in certain quarters in solid apple products, of the type known in Germany as *Rheinisches Apfelkraut*—a type of apple jam made either without sugar or with the addition of only very limited amounts of this ingredient.

Fluctuating Crops

The experiences of 1939-1940 illustrated in an ideal manner the difficulties that are inherent in this whole question of utilising surplus fruit. Continuity of supply of a raw material is a first essential for any manufacturer, and it is not easy to see one's way through the problem at the present time. Quite recently the author was discussing this subject with a party of fruit growers and others, and one of the company, after pessimistically referring to the insuperable obstacles that he could see in the way of suitably arranging for complete utilisation of fluctuating surpluses, threw out the hint that the author should read a quotation from Thomson's *Seasons*, take the quotation as his motto, and cease stirring up the "surplus fruit" mare's nest. Here is the presumed quotation:

An elegant sufficiency, content,
Retirement, rural quiet, friendship, books.
Ease and alternate labour, useful life,
Progressive virtue, and approving Heaven.

Such a life would be repugnant and unbearable and would surely not win the approval of Heaven! The author is a confirmed optimist regarding the possibilities offered by various fruit products as a means of saving the fruit grower very considerable losses, and he will certainly continue to examine and persevere with any process which shows the slightest signs of processing or commercial possibilities. The war may have altered the emphasis from juices to more concentrated products, but "peace aims" have implications outside politics, and the work at Long Ashton, besides having its direct relation to the immediate problems of the war period, is being pursued simultaneously with an eye on the post-war years when Dominion fruit will return to our shores and reintroduce the major problem of surpluses, which was only just becoming acute before the commencement of the present war.

Empire Development

The Dominions and Colonies were already beginning to find the necessity of discovering outlets for their normal surplus fruit before the war started, but the position has been gravely accentuated since 1939 by the practical cessation of imports of fruit into this country. In a way it can be regarded as a case of the problem of utilisation of surplus fruit having been handed by us to the Dominion countries. They are now faced with urgent problems and are tackling the matter with energy and more Government support than has yet been given at home. As a result of the enthusiasm of Mr. M. B. Davis, Dominion Horticulturalist of Canada, and Mr. Arengo-Jones, their Fruit Products Officer, the apple-juice industry there has progressed by leaps and bounds during the last two years, and there are now indications that very large increases in production are likely to be effected next season. The Canadian workers have, in a short space of time, made original and significant contributions to the literature of fruit juices, and their methods are apparently being used with success by commercial installations in Canada. The Government are helping to foster the consumption of juices by propaganda of varying types.

(Continued on page 14)

NEWS FROM THE INDUSTRY

BOILER HOUSE EQUIPMENT

Valves

An interesting handbook has been recently issued by Saunders Valve Company, Limited, describing the various types of diaphragm valves produced.

A streamline diaphragm valve is primarily intended for handling difficult fluids, compressed air, chemicals, gritty or acid waters, etc. The principle of the valve, involved in a flexible, reinforced, positively actuated diaphragm which beds down on a central weir or seat when closed, forms with the body a streamline passage when open; isolates the fluid from the metal working parts; cuts out accurate working—and wearing—metal faces and does away with the necessity for reseating. The resilient nature of the diaphragm permits the closing of the valve even over small solid matter. Straightway valves are also made. A list of fluids and indications of types of diaphragm or plug and diaphragm and straightway valve bodies is given in the booklet.

* * *

Mechanical Stokers

A combination of mechanical stokers and fixed forced draught firegrates, complete with the fan-driven air system, is one of the boiler-house features of Crosthwaite Furnaces and Scriven Machine Tools, Ltd. While the efficiency is not quite equal to that given by the newer self-cleaning grates, this is compensated by the absence of upkeep costs and considerable economies are effected by the use of fuels which could not otherwise be burned. The firebars are of standard fixed forced draught type, having a guaranteed life of ten years.

* * *

Made in ranges capable of handling all types of industrial boilers up to 12,000 lbs. of steam power per hour, the mechanical stokers of Henry Hope and Sons, Ltd., are constructed to operate on a very large range of fuels. Variable speed gear boxes are fitted and all machines can be operated under automatic control. A number of the larger industrial machines are fitted with side grates which permit hand firing in the event of any interference with the electrical supply, and large capacity hoppers are fitted which enable the machines to operate under automatic control without manual attention for long periods.

* * *

Steam and Water Mixers

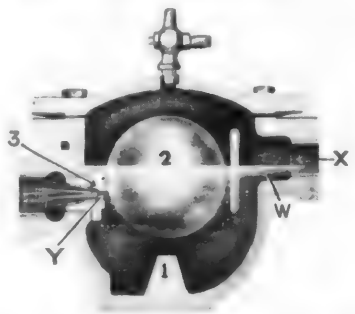
An interesting batch of literature describing the Leonard-Thermostatic Water Mixing Valves and Steam and Water Mixers has been received from Walker, Crosweller and Co., Ltd. The steam and water mixer enables hot water to be obtained by directly mixing steam and cold water, and will find an application in many industries. Changes in supply pressures will not affect the mixer, and hot and cold water supplies can be used when steam is not available. The whole range of applications is fully described and illustrated.

Steam Traps

A trap with only one working part, and that a freely floating ball, called the "Simplicity" trap, is made by the Key Engineering Company, Limited.

The action is as follows:

When the trap is not operating the orifice Y is closed by the ball 2, which is held against it by the unbalanced pressure of the steam entering at X and the atmospheric pressure at Y. The ball 2 always floats 60 per cent. submerged; thus the orifice Y is drowned and a water seal between the orifice and the steam is always maintained.



As the condensate flows in, the water level W rises, and the buoyant force of the water rolls the ball upwards on the face of the discharge bushing 3, exposing part of the orifice Y. The ball continues to rise according to the amount of condensate flowing until the entire face of the orifice is exposed. During this time the trap is discharging freely. When the flow decreases the ball slides downwards and again seals the orifice, taking up a different point of contact on the ball, thus ensuring a long life.

It will be noted that all possibility of steam leakage is eliminated by the water seal which is provided at all times between the steam in the trap and the discharge orifice Y.

* * *

Pressure and Draught Recorders

A folder illustrating practically every industrial requirement for indicating pressure or draught has recently been issued by the Cambridge Instrument Company, Limited. An outstanding feature of one of these is the electrical edgewise indication design for multipoint use and mounting of panels; it is arranged for units, each consisting of one, three or six pressure systems, and any number of units may be mounted together in line. Another interesting item is an Electrical Distance Pressure Recorder, in which movements of the Bourdon tube are transposed into fluctuations of an electric current operating a galvanometer, which may indicate or record at a distance. A Portable Pressure Recorder obtains permanent records of periodical tests of pressures or vacua at different points in a factory. They range up to 500 lbs. per square inch.

Hands Across the Sea

The London Chamber of Commerce received the following cable from the Associated Chambers of Commerce of New Zealand, Wellington:

> "Associated Chambers of Commerce New Zealand assembled at their Annual Conference send greetings to your Chamber the delegates think constantly of you in all your difficulties and express their unbounded admiration at the fortitude and courage displayed by all citizens of the United Kingdom"
>
> PRESIDENT MACGIBBON,

and replied as follows:

> "Your cable on behalf Associated New Zealand Chambers Annual Conference read meeting Tuesday Council London Chamber who recalled friendly personal contacts your members and ours Empire Congress 1936 warmly reciprocate greetings stop knowledge thoughts New Zealand friends with us present troubles source of strength and encouragement stop entire community London and provinces undaunted and determined maintain civil commercial and industrial activity in full measure until victory won"
>
> GEOFFREY CLARKE,
> *President.*

* * *

Metafilters

After many years of chemical research and intimate experience with research and intimate experience with filters, the inventor of the Metafilter concluded that a simple and efficient filter was badly needed. There was no shortage of filters, but many were wasteful, dirty to operate and difficult to clean, among other difficulties. The research, experiments, setbacks, experience, successes crowded into the years since 1927 have culminated in the production of a range of filters whose efficiency for the most diverse forms of filtration has been demonstrated.

The Metafiltration Co., Ltd., has recently issued an interesting booklet describing the patents and classes of filters in which they specialise. The main basic patents cover two types of filters: (1) Filters using renewable filter-beds. (2) Filters using renewable filter pockets.

The main advantages of Metafilters are briefly the following: (1) Fineness of filtration can be obtained to any limit. Although Metafilers without the help of the filter-bed can be brought to filter particles down to 0·0001 inch, the chief advantage of the filter is obtained when used with the filter-bed, when the fineness of filtration can be brought up to the borders of fields usually considered accessible only to ultra-filters. (2) Stability and strength are features of the filters, as they contain no weak parts and the filtering units are held together without the help of solder or brazing, so that no trouble is likely to arise from electrolytic corrosion, nor are they likely to be damaged by mechanical ill-usage.

The British Rheologists' Club

The inaugural meeting of the British Rheologists' Club (which concerns itself with the flow and deformation properties of materials) was held on November 16 last at the University of Reading. The meeting was remarkably well attended, demonstrating the need for such a club—members coming from all parts of the country. Professor J. A. Crowther, Professor of Physics in the University, presided. The morning session was devoted to a discussion of "Rheology in Industry", the opening speakers being Mr. J. Pryce Jones and Mr. F. D. Farrow.

This opportunity for exchange of views and for gaining a knowledge of new instruments was welcomed by all who attended the meeting. It was generally agreed that they would now return to their various problems in rheology, many of which are now of national importance, with fresh ideas and new weapons of attack.

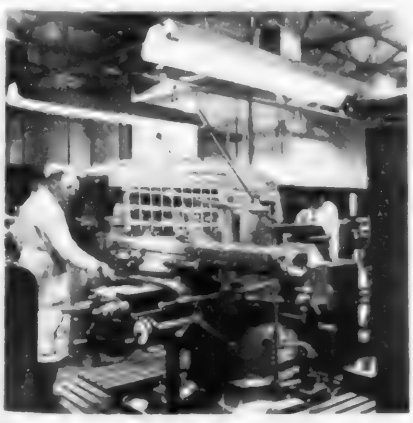
* * *

War-Time Lighting

In some recent work done in the research laboratories of the British Thomson-Houston Company, Ltd., it was felt that the type of high-quality lighting installation more likely to eliminate eyestrain and other attendant disabilities was one in which adequate illumination was provided by low brightness sources carefully disposed relative to the position of individual operators, and that other causes of fatigue and depression might be avoided by giving attention to the control of the level of brightness in the field of view and to colour rendering, natural daylight being the ideal.

The conclusion was come to that the Mazda 80-watt tubular fluorescent lamp, with its exceptional characteristics, would be an ideal source to use, especially as the low surface brightness of the lamp appeared to eliminate direct and reflected glare and the natural colour contributed to psychological welfare.

As a result of the investigations it was found possible to draw up a code which could be used to cover most of the requirements of high-quality lighting and thus provide proper light conditioning in factories.



Mazda 80-watt tubular fluorescent lamps producing glitter-free high-quality lighting on a milling machine.

Food Executive Officer "Commended" in "Gazette"

The Minister of Food is pleased to announce that Mr. Frank Owen Sudbury, a Food Executive Officer, has been "commended" in the *London Gazette* for his conduct in an emergency.

One day in August some 600 firemen arrived in Mr. Sudbury's area, which had been bombed. Mr. Sudbury immediately organised billeting accommodation and obtained bedding, blankets, etc. At the same time he made efficient feeding arrangements for the men.

With the approval of the Fire Brigade Chiefs he obtained voluntary workers who cooked and waited upon the brigades. Some of the men who had come at short notice arrived without their iron rations, but a meal was ready for them. Mr. Sudbury obtained the necessary foodstuffs that were urgently required and had the stocks replenished from a neighbouring town.

He organised reception centres and feeding centres and, when everything was in smooth working order, looked after the comfort of the men with the co-operation of the local military authorities.

Mr. Sudbury kept all the catering accounts and controlled all purchases, issuing the necessary vouchers and official orders. The final accounts were delivered within forty-eight hours of the men's departure, and the total cost of all services, including meals and the necessary purchase of a certain amount of equipment, worked out at less than 10s. 6d. per man per week. He worked practically night and day for twenty days, to the great satisfaction of all concerned.

Letters of appreciation of Mr. Sudbury's action have been received from the Fire Brigade, and it is a source of great satisfaction to Lord Woolton that the services of one of his Food Executive Officers have been publicly recognised by a "commendation" in the *Gazette*.

* * *

Alcohol in Industry

"Tons of grain, sugar and glucose are being used every week in the production of alcoholic beverages at a time when we are told to economise in food," said Dr. S. Horwood Tucker, Senior Lecturer in Chemistry at Glasgow University, when addressing the luncheon in Edinburgh of the National Commercial Temperance League. He quoted the many vital uses of alcohol in industry in the manufacture of many substances and in the motor industry, and stated that he hoped the time would come when alcohol would not be used as a beverage and when the distilleries would no longer find it worth while to manufacture it for that purpose, but would get a good income from it by producing it only for industrial and essential purposes.

* * *

Board of Trade

The new postal address of the Board of Trade headquarters is Millbank, London, S.W. 1. Telephone: Whitehall 5140. Telegraphic address: Boneblack, Parl, London.

OBITUARY

Lord Vestey

Lord Vestey, managing director of the Union Cold Storage Co., and head of the Blue Star Line, died at Gerrard's Cross, Bucks, aged 81. Born at Liverpool, he was associated with his brother, Sir Edmund Hoyle Vestey, in shipping, mainly carrying refrigerated foodstuffs.

The company which Lord Vestey directed until his death owns freezing works, cold storage, and cattle ranches, and he never released his control of the world's meat markets.

* * *

Mr. Albert J. hurston

The death occurred suddenly on November 2 of Mr. Albert J. Thurston, 17, Letham Drive, Newlands, Glasgow, who was associated with Nestles, Ltd.

* * *

Mr. George Mathieson

We regret to announce the death, at the age of ninety-six, of Mr. George Mathieson, a well-known figure in the confectionery trade. He was one of the founders of the business of Clarke, Nickolls and Coombs, Limited.

* * *

Bournville News

We have received the *Bournville Works Magazine* for November, which gives an account of recent activities at Bournville. It covers many aspects of the business, from production to sport.

An interesting feature consists of letters from members of Cadbury Brothers, Ltd., who are serving in H.M. Forces. This is copiously illustrated with photographs.

There is also a report of a meeting of the members of the Men's Council and Shop Committees and all Management Staffs to hear a statement on the position of the business made by Mr. Paul Cadbury on behalf of the Board.

Mr. Paul Cadbury referred to a statement at the previous meeting by Mr. Lawrence Cadbury which was "to discuss the sales policy of the business and our ultimate objectives". Mr. Paul Cadbury then dealt with present problems, which ranged from raw materials, labour, export, transport, costing and sales policy.

Such a meeting demonstrates the close contact which exists between the Board and the employees. The publication is an excellent example of a House journal.

* * *

Mr. Thomas McLachlan, F.I.C.

Mr. McLachlan wishes to thank his numerous friends and clients who have called, telephoned or written to express their sympathy at the repeated effects of enemy action on his laboratory, and asks them to excuse a personal letter in the circumstances. He has been glad to avail himself of the hospitality of the Pharmaceutical Society and will be grateful if correspondence and samples are sent to him for the present c/o The Pharmaceutical Society of Great Britain, 17, Bloomsbury Square, W.C. 1.

Geared Motors

A new catalogue embodying all their latest designs of efficiency geared motors and reduction gears, and representing the knowledge gained with this type of gear over many years under actual working conditions, has just been issued by Crofts (Engineers), Ltd.

The general arrangement of the catalogue is designed to enable selection of a suitable unit for any required speed and horse-power. Units complete with motors or for incorporating with any make and type of motor of both the horizontal and vertical designs are listed; also many special designs which have been standardised to meet general requirements.

* * *

Pass-out Turbines

The conversion of the heat energy in steam to electrical power with an efficiency of over 90 per cent. is a very attractive proposition. This conversion is possible for all industries employing heating steam, and as an example may be quoted the two 1,500 kw. Allen geared pass-out turbo-alternators which are under construction for a canned meat factory in South America by W. H. Allen and Co., Ltd.

By generating heating steam at a suitably high pressure—in this case at 250 lbs. per square inch gauge, 558° F. total temperature — and passing it through a turbine as a reducing valve, electrical power can be generated, the only losses being the small amount of friction in the machinery and the electrical loss in the generator, which together do not amount to 10 per cent. of the power generated.

Apart from these small losses, all the heat originally present in the high-pressure steam is available for use *either* as electrical energy *or* as heat in the process steam.

In cases where the process steam will not supply the whole of the power requirement of the factory, or where the process steam demand is liable to fluctuations, an L.P. portion is provided on the turbine through which steam can be passed to condenser to generate that portion of the electrical load which cannot be got from the process steam. Thus, in the case of the pass-out turbines mentioned earlier, the maximum process steam quantity is 36,000 lbs. per hour at 55 lbs. per square inch gauge, which will yield somewhere in the neighbourhood of 900 kw. electrical load. The remaining 600 kw. is obtained by passing steam through the low-pressure stages of the turbine and exhausting it to a condenser at 27½ ins. Hg vacuum. Furthermore, as the process steam quantity is liable to fluctuation, the condenser is actually designed to condense 17,800 lbs. of steam per hour, which represents about 1,200 kw. when no pass-out steam is withdrawn.

* * *

Synthetic Sausage Casings

A fire at the works of Brainos and Co., the new casing manufacturers, has impeded production considerably, having burnt out a drying machine, but they hope soon to return to normal production. Mr. Brainos is contemplating opening a factory in the country in the near future.

Buffet Cars for Troop Trains

By arrangement between N.A.A.F.I. and the L.M.S. Railway, several buffet cars are being put into service for the convenience of members of the Forces making long journeys by special trains in this country. The buffet cars are manned by N.A.A.F.I. staff and afford both ordinary table accommodation and quick-service-counter facilities. They are already proving very popular, a single car serving as many as 500 customers on a long journey.

* * *

Insect Pests

Mr. W. Grant, manager of the Scottish Co-operative Wholesale Society's Regent Flour Mills, Glasgow, gave an address on "Insect Pests" at a meeting of the Scottish Co-operative Bakery Managers' Association recently. He said that the question of insect pests was a matter of interest to many people besides those responsible for the production of bread and the safe storing of flour, and it should not have needed a war to make people realise the importance of keeping food free from pests.

He described the life-story of insects which gave particular attention to flour and bakery materials. There was no 100 per cent. effective insecticide; cleanliness and tidiness, fresh air and light were the only effective preventatives. The black-out had in many cases produced the very conditions most favourable to their increase. Regular cleaning of premises, particularly of out-of-the-way corners, should be undertaken, and all possible light and air admitted.

Mr. J. Lindsay, technical superintendent of the Wholesale Society's flour mills, said that their policy for some time past had been to pack flour in new bags only, returned bags being used for offals.

* * *

Rot-Proofing of Sandbags

"A cheap and easy method of rot-proofing sandbags consists of dipping the bags in two common chemicals, sodium carbonate and copper sulphate. Treatment with this mixture at the present price works out at no more than one-tenth of a penny per bag of normal size. It will, it is estimated, increase the life of sandbags in service at least eight times," announces Imperial Chemical Industries.

The bags must be treated before they are filled. No rot-proofing process is satisfactory when applied to bags already in place. Whether they are treated before or after being sewn up, particular care must be taken to treat the thread used for the seams, as it is often here that the rotting begins.

During the research into the rot-proofing of sandbags that I.C.I. have carried out over the past two years, samples of treated and untreated jute and cotton fabrics have been buried in garden soil for eight months. The fabric treated with the mixture remained in excellent condition while the untreated fabric was almost completely disintegrated.

Further particulars, including directions for carrying out the process, can be obtained from the company.

Vitamin B$_1$ White Bread

By rendering available a white loaf containing as much vitamin B$_1$ as wholemeal bread, H. W. Nevill, Ltd., have anticipated the Government vitaminised loaf. The result of their own research work, the bread will be sold at the price of ordinary white bread, but in order to counter the extra cost of production it is proposed to dispense with the usual waxed paper. Every ounce of the bread contains approximately 24 International Units of vitamin B$_1$.

* * *

Fuel Research Board

Problems under investigation by the Fuel Research Board have been described in the report issued by the Department for Scientific and Industrial Research, and include the deterioration of coal by weathering, the cleaning of fine coal and the "dustproofing" of coal. Research work in progress covers the hydrogenation of different raw materials, a study of catalysts and the "cracking" of oils. Laboratory experiments and work on a plant of semi-technical scale are both described, and further treatment of certain fractions of the primary product shows promise of yielding lubricating oil; and an account is given of the development of gas-producers for motor vehicles.

* * *

Foster Clark, Ltd.

Foster Clark, Ltd., manufacturers of proprietary foodstuffs, canners, packers, etc., reports total profits of £90,284 for the year to mid-September last, the comparable total for 1938-39 being £87,158. Since last year profits were struck after all provision for taxation —apart from a sum of £5,000 charged against revenue for tax reserve—it is obvious that the company found conditions more profitable than during the previous year, when successive international disturbances found reflection in restricted sales for some products. The profits now announced cover an Ordinary distribution of 20 per cent., less tax, for the eighth successive year, although maintenance of this rate has entailed a fairly close distribution of available earnings in recent years. Profits are still some way below the levels returned prior to 1932, but the undertaking has a satisfactory E.P.T. standard (profits of £96,380 were returned in 1934-35), and it should continue to do well under present conditions, according to the *Financial News*.

* * *

Ministry of Food Appointments

Mr. J. A. Peacock, who has hitherto been Director of Imported Eggs, has now been apointed Director of Eggs.

Mr. C. A. Flatt has been appointed Assistant Director of Home Produced Eggs.

* * *

New Director

Mr. D. B. Hoseason, M.I.E.E., M.I.Mech.E., M.A.I.E.E., has been appointed to the Board of the Brush Electrical Engineering Co., Ltd.

INFORMATION AND ADVICE

Lucerne Meal — "Bibliofilm" Service — Cooking of Vegetables — Chutney — Information Supplied — Information Required

Lucerne Meal

6,511. *We desire to make tablets of Lucerne meal, and we are having difficulty in finding a suitable binding medium which will permit the use of a free-flowing tablet composition for the tableting machine. The meal will not bind by itself. Any suggestion which you can offer will be much appreciated.* (Lincoln.)

We submitted a sample to an expert, and his report was that the material does not possess any binding qualities, and a tablet, when produced, is most readily disintegrated into powder. Provided there are no objections on grounds of subsequent usage, it appears that the addition of a small percentage of rice powder or starch assists in the formation of a rigid tablet.

"Bibliofilm" Service

6,803. *We notice in the October issue of* Food Manufacture, *in the article "Quality Control", that an information service is mentioned known as "The Bibliofilm Service".*

We are wondering if any such service is available in Great Britain, as there are a great number of articles published in various journals which are extremely difficult to get hold of. (Belfast.)

We do not know of a "Bibliofilm Service" operating in this country. It is probable that questions of copyright might be concerned which do not affect the United States, whose "Bibliofilm Service" was referred to in the article on "Quality Control".

Cooking of Vegetables

7,004. *In* Food Manufacture, **15**, 194, 1940, *there is a reference to the discolouring of the chlorophyll of green vegetables during cooking by "volatile sulphides" and to the possibility of avoiding this effect by leaving off the lid of the cooking vessel. The use of methylene blue to preserve the colour of vegetables during cooking is also referred to. I should be very grateful if you could give me the references to the original work on these two points. I have been unable to trace the relevant papers.* (Cambridge.)

With regard to the addition of methylene blue, there is no specific reference made in the literature, but it has been employed in practice, especially in the case of peas. The suggestion of leaving the lid off during cooking of green vegetables in order to allow "volatile sulphides" to escape has been made by various cookery teachers, and was referred to in a leading article in the *Lancet*, June 22, 1940, page 1128.

Chutney

6,709. *We shall be glad if you would let us have a recipe for making a good-class chutney.* (Harrogate.)

Beetroot Chutney may be made by boiling, say, 50 lbs. beetroots and then plunging them into cold water and immediately skinning them. Soak 1 lb. dark gum tragacanth in 1 gallon vinegar overnight, and next day stir well and add another gallon of vinegar and place in steam pan. Add sugar (say, 10 lbs.) and salt. Chop the beetroots, onions, lemons and chillies and add to the pan. Ground ginger and ground white pepper should also be used.

When using gum tragacanth, always soak it overnight in vinegar—say, about 1 lb. gum to 1 gallon vinegar.

The extent of dilution of acetic acid of, say, 80 per cent. strength depends on the strength of the vinegar you wish to match. Thus 16-grain vinegar contains roughly about 4 per cent. acetic acid, 20-grain 5 per cent., 24-grain 6 per cent.

Tomato Chutney: A batch sufficient to yield 24 dozen 8-oz. bottles may be made from 70 lbs. canned, skinned tomatoes, 25 lbs. fine-chopped onions, 14 lbs. seeded and fine-chopped raisins, 5 lbs. sultanas, 12 lbs. fine-chopped and preserved ginger, 2 lbs. fine-chopped lemons, 28 lbs. sugar and 1 lb. salt. This would require 4 gallons of water and, say, 1 lb. gum tragacanth. Vinegar is added in sufficient quantity, and also spice oils to taste, which might include pimento and cassia. White pepper should also be incorporated, as well as the desired amount of red colouring matter. The whole should be boiled gently for about 15 minutes.

Information Supplied

6,485. *We shall be glad if you can refer us to any manufacturer and/or supplier of perforating machines used for the purpose of dating wrappers. The type of machine which we have in mind is one which punches a series of small holes in the wrapper in the form of figures, which can be read when the wrapper is held up to the light. The machine which we have in use at present has gone out of order, and we are unable to trace the source from which it was obtained.* (Glasgow.)

Names of some suppliers were given.

6,493. *Can you let us know of a suitable flooring for the kitchens of our factory, such floor being able to stand up to moisture, steam, fat, etc.?* (London.)

The name of a firm who makes this was given.

6,522. *We note that reference is made in* Food Manufacture *to a substitute for glycerine, called Sucromel. We are particularly interested in this substitute in its application to glacé fruits and jams, and would like to get in touch with its makers.* (South Africa.)

The maker's name was given.

6,524. *We shall be glad if you would give us the names of manufacturers of the following machines:*

1. *Can sealer.*
2. *Pressure cooker for preserving.*
3. *Tomato purée machine useful for making tomato ketchup.*

This was done.

6,255. *Will you please give us the following advice: Addresses of the firms from whom requisite machines for scooping lemons can be obtained?* (India.)

The names of firms were supplied.

6,354. *We require the services of an expert sausage maker who can advise us on the compilation of formulæ and queries from the butchery trade. We are therefore writing to enquire whether you are in a position to recommend someone to us.* (Hertfordshire.)

A recommendation was made.

6,484. *Will you please be good enough to send us the names and addresses of suppliers of edible soluble casein, and oblige?* (Essex.)

Names of suppliers given.

6,527. *I have received an enquiry for a small conveyor type of roaster for the baking of macaroons. This enquiry has been made by a manufacturing confectioner, but I am unable to find any firm catering for bakers' and confectioners' sundries, ovens, etc., who either make or have made such a type of oven. It is obviously a very much smaller edition of the ordinary conveyor baking oven, as made by well-known firms, but apparently is not made by these firms.* (Manchester.)

Suggestions as to possible suppliers were made.

Information Required

6,656. *Can you suggest a dusting powder or other treatment for the prevention of damage by flies to fresh meat, such as rabbits, while in transit?* (Eire.)

6,695. *Will you kindly let us have a formula for egg substitutes?* (Wrexham.)

6,698. *We are in the market for a vegetable dicing and cutting machine, and we are wondering if you can oblige us with the name of the manufacturers of the "Sterling Vegetable Cutter and Dicer".* (Aberdeen.)

7,201. *Can you please tell us where in England we could get knives suitable for Alexander Mincer M.W.L. 200?* (Eire.)

7,006. *Do you happen to know who makes the "Ever Ready" food chopper?* (London.)

RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

Improvements in Process for Drying Whey

The production of a heavily concentrated whey solution containing solids, a preponderance of which is lactose, said solution being of such heavy concentration as to prevent free movement of seed crystals therethrough and introducing substantially dry lactose seed crystals and applying heat to said solution to effect simultaneous drying of said solution and crystallisation of the lactose in solution.

The concentrated whey solution is produced by applying heat to evaporate the water and reduce it to a crystal-free solution concentrated to a degree close to saturation before introducing the dry lactose seed crystals. The concentrated whey solution is produced in crystal-free form by applying heat to evaporate the water and reduce it to from 35 to 93 per cent. solids before introducing the dry lactose seed crystals. It is produced at a temperature considerably above 212° F. to effect rapid concentration to approximately 66 to 93 per cent. solids before introduction of dry lactose seed crystals.

The introduction of the seed crystals is effected by seeding a heated surface with lactose crystals and spreading the concentrated whey solution in the form of a layer on said seeded and heated surface, which is heated well above 199·4° F. to permit initial formation of a seeding layer of beta crystals. The seeded surface is heated to a temperature of 250° to 287° F., and the layer of concentrated whey solution spread thereon is maintained on said surface for from 20 to 80 seconds.

The seeding is effected on a revolving heated surface by incompletely removing from the revolving surface the layer of material after being dried, so as to leave a coating on the revolving surface containing dry crystalline lactose serving as the seed crystals. The revolving surface is heated and the layer retained thereon till the moisture content is reduced to less than 5 per cent., the concentration of the concentrated whey spread upon the revolving surface being sufficiently high as not to remove the layer of seeding material therefrom.

The whey solution is first preconcentrated to approximately 30 to 50 per cent. solids to form a heavy solution, whereafter said preconcentrated solution is subjected to an intermediate concentration by heat at a temperature considerably above 212° F. to effect rapid concentration to approximately 66 to 93 per cent. solids before introduction of dry lactose seed crystals.

The intermediate concentration is continued for such length of time that the solution is substantially in the form of a viscous material containing so much water, that the heat remaining in the material is insufficient to dry the viscous material into which the dry lactose seed crystals are then introduced. The intermediate concentration is effected by supplying heat at a temperature of from 250° to 307° F. for from 20 to 60 seconds. The preconcentration is effected under vacuum.

The intermediate concentration is effected by spreading the preconcentrated solution in form of a layer on a heated metal surface, whereafter the viscous material formed is removed and passed to the second heated surface where the dry lactose seed crystals as crystalline beta lactose are introduced, and the material, after drying and crystallisation, is removed.

As a new product of manufacture when produced by the process as described, dry whey solids composed of proteins, mineral salts and lactose in substantially the same proportions as in the whey prior to drying, said components being cohered and in finely divided form, and a preponderance of the lactose being in the form of beta anhydride crystals present in an amount substantially in excess of the amount of beta lactose in equilibrium in the whey prior to drying.
522,054. Charles Oscar Lavett.

Latest Patent Applications

14205. TWEEDALE, C. L.: Manufacture and preparation of cereal foodstuffs. Sept. 14.
13944. BELLAMY, A. J.: Egg product. Sept. 6.
14110. EVERY, C. E. (BAADER): Dressing of fish. Sept. 11.
14111. EVERY, C. E. (BAADER): Sorting of fish. Sept. 11.
14112. EVERY, C. E. (BAADER).: Apparatus for treating fish. Sept. 11.
13597. CRITCHLEY, H.: Egg substitute. Aug. 29.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

521,047. SHEPHERD, G. R. (WESTINGHOUSE ELECTRIC AND MANUFACTURING CO.): Apparatus for treating and/or storing food. (Convention date not granted.)
524,728. BRITISH EMULSIFIERS, LTD., and CURZON, T.: Liquid-emulsifying apparatus.
524,877. TRITTON, S. M. L. W.: Canning. (Cognate application 13968/39.)
524,940. CROWE, G. E. W., and COLEMAN, C. J.: Apparatus for cooking, digesting, sterilising, or otherwise treating edible or other goods by fluid pressure.
525,003. LOWE FOOD PRODUCTS CO., LTD., J., and GLAZE, R. C.: Synthetic milk.
525,014. APPLIED SUGAR LABORATORIES, INC.: Sugar refining.
525,031. KREIDL, I.: Production of a sweetening agent.
525,043. VOLPERTAS, Z.: Reducing vegetables containing starch to a dry powder.
525,151. ORIVE, F., and BASUALDO, J. R.: Sterilising food products.
524,725. JACKSON, J. P.: Meat-tendering apparatus.
526,303. VICARS, LTD., T. and T., and CROSLAND, E. M.: Biscuit-making machinery.
526,305. DEWEY AND ALMY, LTD. (DEWEY AND ALMY CHEMICAL CO.): Packaging of materials, particularly perishable foodstuffs.
526,245. KEENOK CO., LTD., and WALL, W. H.: Machines for separating the yolk from the albumen of eggs.
526,128. VIGNOLO, G.: Machine for removing stalks from fruit.
525,817. VICARS, LTD., T. AND T., and CROSLAND, E. M.: Biscuit-cutting and the like machinery.

TRADE MARKS

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

BISON.—612,601. Tea, coffee, cocoa and chocolate. **R. Twining and Co., Ltd.**, 216, Strand, London, W.C. 2. Sept. 18.
Registration No. 454,374 (2442) xlii will be cancelled if and before the Applicants' Mark is registered.

BUFFALO.—612,602. Tea, coffee, cocoa and chocolate. **R. Twining and Co., Ltd.**, 216, Strand, London, W.C. 2. Sept. 18.
Registration No. 454,373 (2442) xlii will be cancelled if and before the Applicants' Mark is registered.

MAID OF DEVON.—612,431. Dried milk, cream, butter, and other dairy products. **L. Garvin and Co., Ltd.**, Garvin House, Twickenham Road, Isleworth, Middlesex. (Associated.) Sept. 25.
It is a condition of registration that the Mark shall be used only in relation to goods the produce of the County of Devon.

612,432.—Honey, preparations of honey and sugar, and sweets made from honey. **L. Garvin and Co., Ltd.**, Garvin House, Twickenham Road, Isleworth, Middlesex. (Associated.) Sept. 25.
It is a condition of registration that the Mark shall be used only in relation to goods the produce of the County of Devon.

OMAR.—612,605. Tea, coffee, cocoa and chocolate. **R. Twining and Co., Ltd.**, 216, Strand, London, W.C. 2. Sept. 18.
Registration No. 454,377 (2446) xlii will be cancelled if and before the Applicants' Mark is registered.

SAFARI.—612,606. Tea, coffee, cocoa and chocolate. **R. Twining and Co., Ltd.**, 216, Strand, London, W.C. 2. Sept. 18.
Registration No. 454,379 (2442) xlii will be cancelled if and before the Applicants' Mark is registered.

NEW COMPANIES

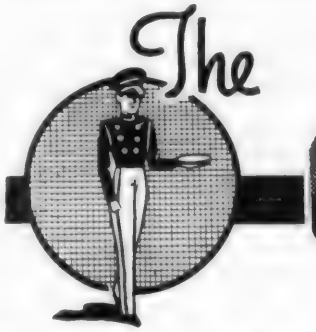
Animal Feeding Stuffs C.I.F. Buyers' Association of Liverpool Limited. (363044.) Management Committee: Members to be nominated by J. Bibby and Son, Ltd.; Edward Billington and Son, Ltd.; Calthrops, Ltd.; Crosfields Oil and Cake Co., Ltd.; R. Silcock and Sons, Ltd.; Associated London Flour Mills, Ltd.; Co-operative Wholesale Society, Ltd.; Cattle Food Supply Co., Ltd.; and the Government.

Cardboard Box Makers (Liverpool) Limited. (363353.) Paula Works, Farnworth Street, Liverpool. To take over the business cd. on by J. Jacobs and P. Jacobs at Liverpool. Nom. cap.: £2,000 in £1 shs. Permt. gov. dirs.: J. Jacobs, 64A, The Promenade, Southport; P. Jacobs, 9, Ballantrae Road, Liverpool, 18.

Colmore and Cook Limited. (363155.) 50, Islington Park Street, N. 1. Seed crushers and mnfrs. of linseed, cotton and other oil cakes, etc. £500. Dirs.: C. A. Colmore, The Old Forge, Harvel, Nr. Meopham, Kent. F. H. Cook, Little Manor, Church Road, Watford. S. Atkinson, 59, Doughty Street, W.C. 1.

K.P.P. Limited. (363179.) To acquire letters patent relating to the mnfre. and improvements in margarine, oils, fats, etc. £1,000. Dirs.: J. E. Kerr (permt.) and Constance Kerr, addresses not stated. Sub.: H. Benjamin, 6, Kingsend Court, Ruislip, Middlesex.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.



The John THOMPSON (DUDLEY) LTD. DUDLEY PAGE

Notes on the use of J.T. Plant

Don't try to lubricate our digesters with any patent indigestion mixtures. It's a waste of a good tummyache.

Don't remove the Blades from our Mixers. So far as we know they don't fit any standard safety razor.

Don't send us the piece of shrapnel you picked up in your garden and tell us that it is a defective bit of metal from one of our plants. We know our children after they grow up.

J.T Works A.R.P. Information

Our Homeguard Black-Guards, A.R.P. First Aid Squads are fully trained and very keen. They are as reliable as J.T. Plant

Extracts from the John Thompson War-time Dictionary

Anti-Aircraft

Obstructionist attitude of Hairdresser towards bald-heads.

Spitfire

A woman's description of another woman.

Hurricane

A man's description of spring-cleaning.

BBC

A daily tuning of Piano

B - flat!

J·Teasers

Seven rivet boys had raided the Canteen through an open window and had found some tins which were full of bags of biscuits. They divided up the total number of biscuits between them and it is a curious thing that there were as many tins as there were bags in the tin and each bag contained just as many biscuits as there were tins. After dividing up evenly all round there were some biscuits left — which were given to the Works dog. How many did the dog have?

Ode from the J.T. Poet Laureate

When "Jerry" comes, the sirens
Shriek out their mournful note,
But we just simply carry on
For WORK's our antidote
Against all War-depression,
For we're busy "to the hilt,"
And thanks to skill John Thompson Tanks
Can ne'er be "Jerry-built."

Section on Technical Terms Simply Explained

Band Conveyors. Used when the crooner gets in his last notes of "luv."

Screw Conveyor. Wages Clerk.

Vacuum. Result of sea trip.

Fractional H.P. The amount of a certain kind of "Sauce" dispensed by Waitresses.

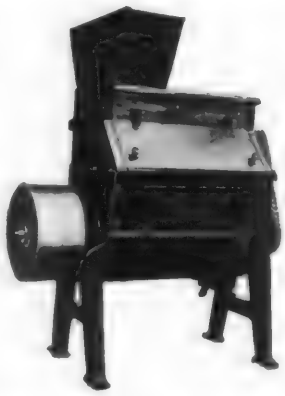
Asbestos joint. Something Father carves on Sunday.

Society News

It is learnt that particular types of J.T. plant are "good mixers," also that J.T. Steel chimneys have been free of the apron strings for years. They are fully self supporting.

After the fullest investigation it has been found that the J.T. plant has a stainless reputation and no scandal can be attached to it.

Facing last page of Editorial



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"Homacol" Liquid Toilet Soap saves—in two ways.
(1) It uses as little as 15% fats, yet gives comparable results to solid soaps using as much as 80% fats.
(2) The drop by drop rationing system from Horton Dispensers prevents all waste.
In addition, the hygienic Horton System avoids the risk of contamination present in the promiscuous use of solid soaps.

HORTON DISPENSERS
are made in a wide range of tilting and rigid models. Write for fully illustrated catalogue.

HORTON JELLY CLEANSER
A unique, extremely efficient and economical cleanser superseding Bar and Soft Soaps for all cleansing purposes. No deposit or scum is left after use and it does not leave a slippery or greasy surface. Odourless and antiseptic, particularly suitable in food factories for cleaning biscuit and cake tins, food containers, butchers' blocks, wood tables, floors, etc. Supplied in cwt. kegs.

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HORTON

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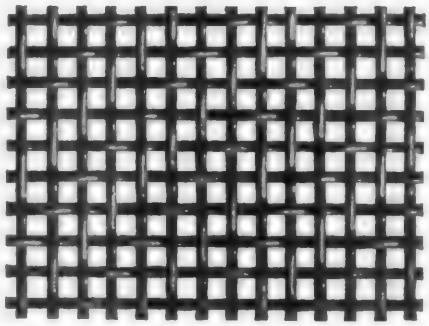

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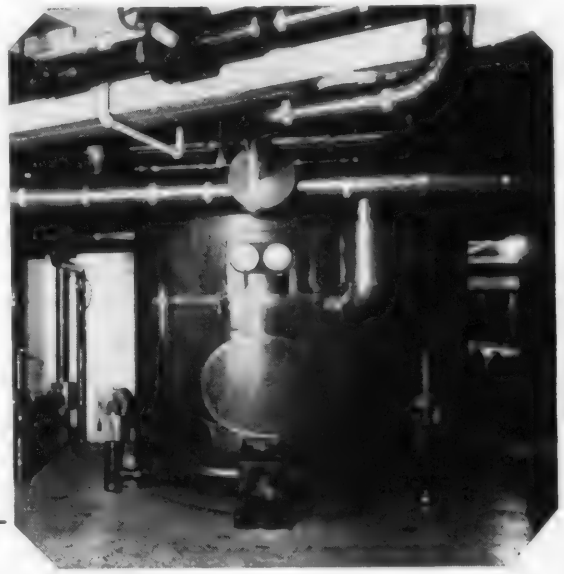
By reason of their fully automatic control, gas-fired boilers are often particularly suitable for food factories. Their patented tubes make Cochran "Sinuflo" Gas-Fired Boilers at once the simplest, the most reliable, and the most efficient. Our technical staff will be glad to co-operate with you as to their adoption.



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THE COCHRAN ECONOMIC (*Kirke "Sinuflo" Patents*).
THE COCHRAN WASTE-HEAT BOILER (*Kirke "Sinuflo" Patents*).
THE COCHRAN VERTICAL BOILER.
THE COCHRAN HOPWOOD.

COCHRAN & CO., ANNAN, LTD., Annan, Scotland
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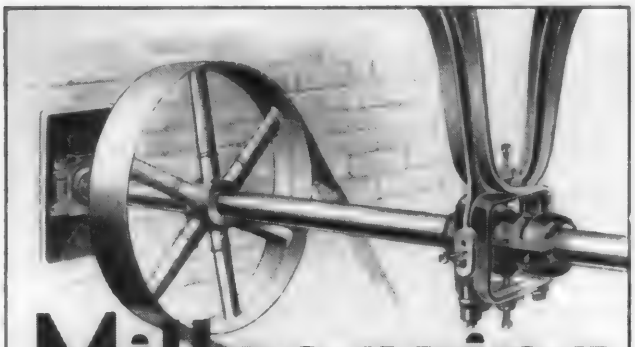

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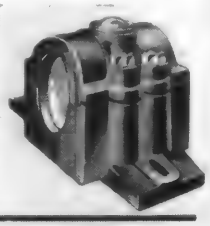

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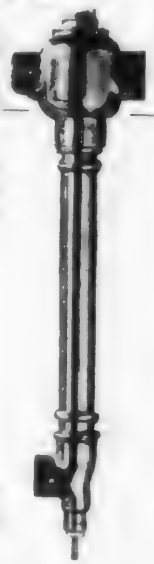

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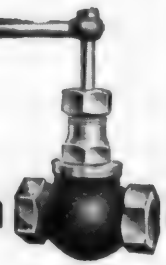

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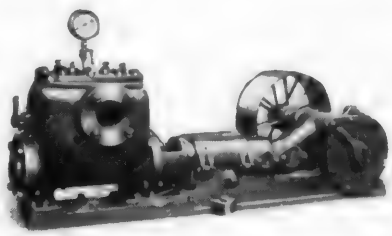

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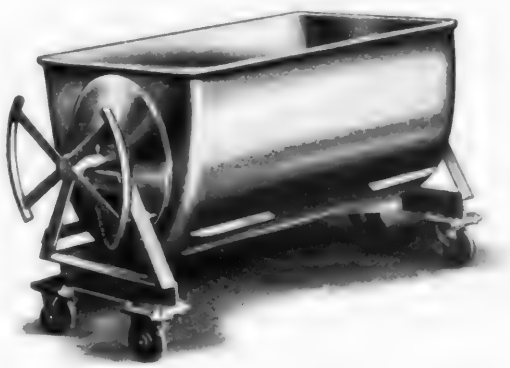

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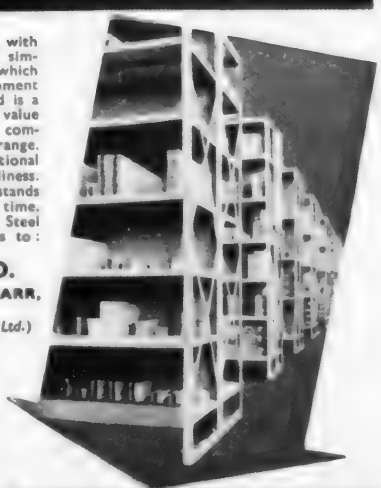

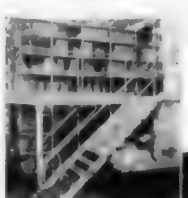

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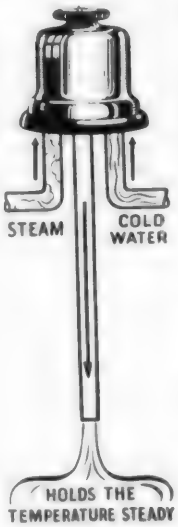

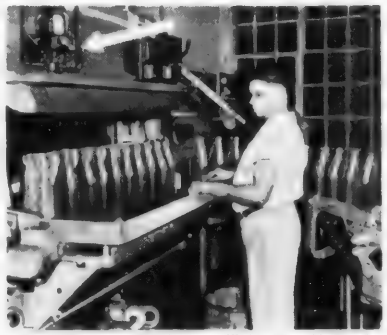

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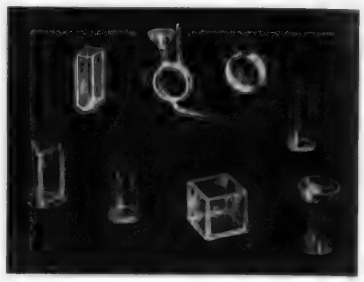
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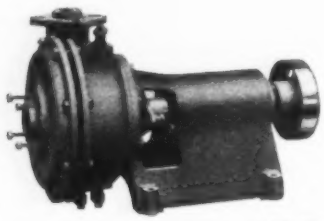

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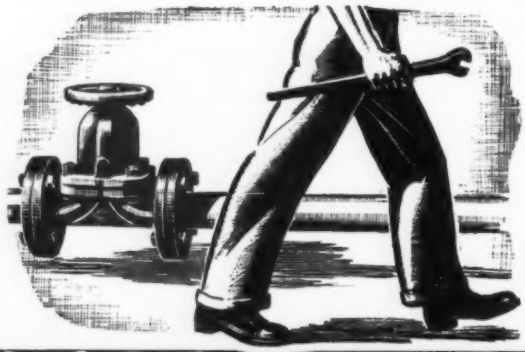

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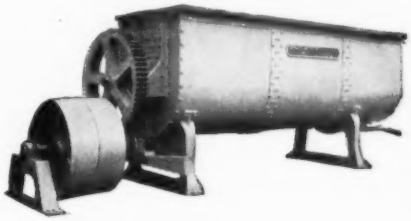

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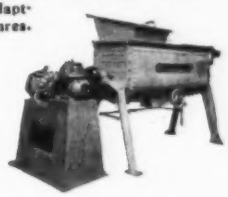

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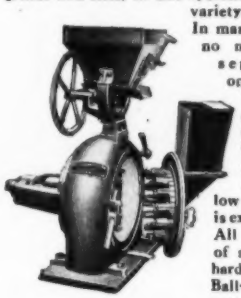

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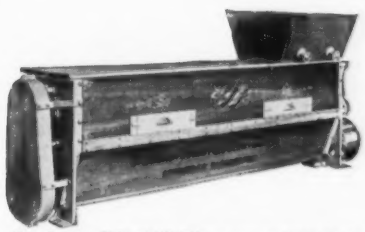

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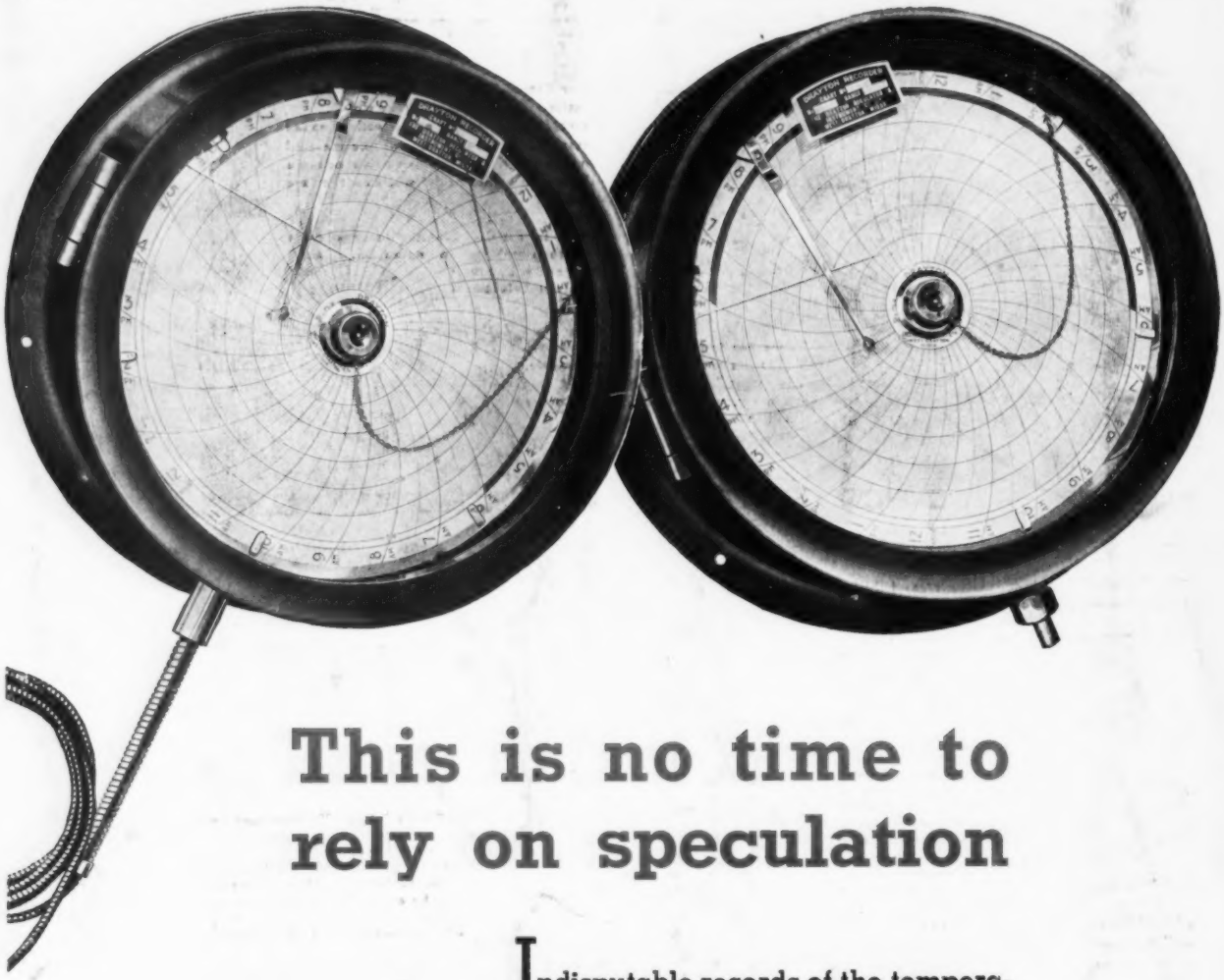

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